COLEGIO DE SAN GABRIEL ARCANGEL

"COLEGIO DE SAN GABRIEL ARCANGEL (CDSGA) SAFETY PREVENTION GATEWAY: AN ARDUINO-BASED PROTOTYPE IN AID OF THE PANDEMIC"

A Design Project Presented to the Faculty of the
College of Computer Studies and Engineering
Colegio De San Gabriel Arcangel
Area E, Fatima I, Sapang Palay, San Jose del Monte City, Bulacan

In Partial Fulfillment of the Requirement for the Degree of
Bachelor of Science in Computer Engineering

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ADVISER'S RECOMMEDATION SHEET

The Design Project Entitled

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Is submitted in partial fulfillment of the requirements for the degree of
Bachelor of Science in Computer Engineering
has been examined and is hereby recommended
for acceptance and approval.

Prof. Jimmy De Vera Roldan, MSIT
Design Project Adviser

May 2022

PANELS' APPROVAL SHEET

The Design Project Entitled

"COLEGIO DE SAN GABRIEL ARCANGEL (CDSGA) SAFETY PREVENTION GATEWAY: AN ARDUINO-BASED PROTOTYPE IN AID OF THE PANDEMIC"

After having been presented is hereby approved
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After having been recommended and approved is hereby accepted
by the College of Computer Studies and Engineering
of Colegio De San Gabriel Arcangel.

Prof. Jimmy De Vera Roldan, MSIT
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N.A.

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CHAPTER 1

INTRODUCTION

In recent times, the world is going towards a bad situation due to Coronavirus disease (COVID-19). Whereas the majority of the country is suffering from this disease as well as everyone is at risk for unseen viruses. Fever is one of the most common symptoms of COVID-19, but due to the infectious nature of the virus, a safety prevention gateway is necessary to limit the risk of transmissions. Safety prevention gateway is defined by Meriam Webster as an opening through which one can enter or leave a place with the state of being not exposed to danger (Retrieved from https://www.merriam-webster.com/thesaurus/gateway. Retrieved date, October 01, 2021). On the other hand, it records the number of visitors, checks body temperature, and sanitize people very quickly without any contact.

In the era of COVID-19, visitor entry procedures are more important than ever. Gathering contact information and criminal data about the people who enter each building is key for safety, but now, we also need to monitor the health of every individual. Look for capabilities that allow for extra screening measures around COVID-19 symptoms including temperature checks, and possibly recent travel history (if necessary, to avoid current outbreak cities/states). The visitor management system also equips you to assist your local health department with contact tracing. In the event that a recent visitor tests positive for the virus, your management system will have captured the exact time they were in the building and where they went. Plus, you'll have a photo on file to help staff and students' reference when determining if they interacted directly with the visitor. These kinds of capabilities offer more certainty during uncertain times. (Retrieved from https://navigate360.com/selecting-a-

school-visitor-management-system-software-for-safer-schools-navigate360/. Retrieved date, November 12, 2021).

Thermometer is an instrument used in measuring the temperature. The name thermometer is coined from the Greek words thermo, meaning “warm”, and meter, meaning “to measure”. So, thermometers measure temperature by using materials that change in some way when they are heated or cooled (Saidu et al, 2014; Bellis, 2011). Measurement of temperature has been a usual process since the early 11th century. Monitoring of temperature of a particular place or system is important so as to monitor the behavior of such a system (Med, 2002). Temperature monitoring devices are of integrated technology and are found in the area of electronics, computers, material and information Engineering. They play an important role in the medical/patient simulation system (Péter & Balázs, 2009). With the help of the temperature monitoring device, a doctor can get a lot of information about the condition of health of the individual. Patients who pay no attention to their body temperature are easily susceptible to contracting diseases/infections as well as some kind of sickness. Thus, for a good guarantee of the patient’s daily life, a monitor designed for measuring the body temperature at a specific time is needed. Temperature measuring devices are also used in medical/fitness equipment, human body temperature monitoring, industrial applications (e.g., fractional distillation processes), and also in research laboratories, such as chemical and chemistry laboratories. Before this time, temperature has been measured using analogue meter. This means of measurement is subjected to error of parallax during the reading of the measurement. Due to the precision requirements of the applications of a thermometer, there is a need to measure the quantity digitally in order to eliminate parallax error. Besides, mercury-in-glass thermometers were used for temperature measurements only while separate instruments were required for checking the

time. Also, mercury-in-glass thermometers have to be handled with extreme care due to their fragile nature (Abayomi et al, 2013).

With the enormous development in the field of NFC (Near Field Communication) technology and the wide use of Android phones, people nowadays are able to accessible to NFC equipped phone. Users are able to handle varied comprehensive tasks in daily life. For example, the images, electronic business cards or other files on one phone can be exchanged to another phone quite easily and fleetly via the NFC communication. Meanwhile, unlike other wireless technologies, NFC focuses on the security control issue, the owners can use NFC-enabled phone to pay wirelessly or transfer encrypted files. NFC (Near Field Communication) is a set of short-range wireless RFID technology that enables simple and safe two-way interactions between electronic devices. It allows the customer to perform contactless transactions, access digital content, and connect electronic devices with a single touch. Users can share business cards, make transactions, access information from a smart poster or provide credentials for access control systems with a simple touch. The data interaction in NFC usually proceeds between an NFC tag and a smartphone, or between two smartphones. NDEF is a lightweight, binary message format that can be used to encapsulate one or more application-defined payloads of arbitrary type and size into a single message construct. The NDEF specification defines a message encapsulation format to exchange information. Since Android has the most support for the NDEF format, which is defined by the NFC forum, and it is the most universal exchange data format when transferring data via NFC technology. (Retrieved from, https://www.theseus.fi/bitstream/handle/10024/90986/Bing%20Dai-thesis.pdf?sequence=1&isAllowed=y. Retrieved date, March 05, 2022).

According to Sharma (2020), hand hygiene is the core preventive measure in the spread of the disease which includes washing hands with water and soap regularly. An automatic hand sanitizer dispensing machine is an automated, non-contact, alcohol-based hand sanitizer dispenser, which finds its use in hospitals, workplaces, offices, schools, and much more. Alcohol is basically a solvent, and also a very good disinfectant when compared to liquid soap or solid soap, also it does not need water to wash off since it is volatile and vaporizes instantly after application to hands. It is also proven that a concentration of >70% alcohol can kill Coronavirus in hands (Retrieved from, https://www.ijert.org/review-on-automatic-sanitizer-dispensing-machine. Retrieved date, October 01, 2021).

History of Colegio de San Gabriel Arcangel

In 1993, Colegio de San Gabriel Arcangel (CDSGA) marked their most significant event in history as an educational institution in Bulacan. With its Article of Incorporation being filed at the Securities and Exchange Commission (SEC), the school formally opened on April 15, 1993, with an excellent idea to initially offer the Basic Education Program as a true expression of its purpose. It was the year, Dr. Gabriel G. Uriarte, the founder, with the inspiration of his wife, Dr. Lucina P. Uriarte had laid the cornerstone of the school's existence with its vision and mission to become the only therapeutic school in town; quite distinct and different from all other existing colleges and universities throughout the Philippines. The school is strategically located in a fast-growing area of the City of San Jose del Monte (CSJDM), Bulacan to which a good number of residents are relocating to a new home and moving increasingly away from the rising traffic congestion in the National Capital Region. The school is conveniently located in a nice residential neighborhood and business establishments in Brgy. Fatima I, Area E, Sapang Palay, City of San Jose del Monte, just

near the Sapang Palay National High School (SPNHS) and San Jose del Monte National Trade School (SJDMNTS). The school started to offer Basic Education Programs, catering Preschool Education, and complete Elementary level in June 1993. The first campus was just a tiny pavilion-like unit that houses the primary levels of basic education. It was in that year that the construction of building A's first floor began. Its completion took place in the first trimester of 1994, signaling the need to offer a complete Basic Education for the next school year. In the succeeding year, the School Year 1994-1995, a complete Preschool, Elementary, and High School curriculum was offered. To maximize the available resources of the school, the residential space of the administrators was used as a makeshift Student Lounge and Library, giving that home-like ambiance to learners and teachers. Simultaneous construction of Buildings A and B upper floors were ongoing back then. Monthly culminating activities took place on the first floor of Building A. The 1-storey of Building B became the new area for Administrative Offices like the Registrar and Accounting Office. Three classrooms were then made available for lower Elementary Levels. In around 2000, the community learners of Sapang Palay had expressed their desire to enroll in CDSGA's Baccalaureate degree programs. However, the institution was still deemed unprepared to undertake the challenges posed by collegiate offerings. So, to accommodate the growing demand for tertiary education, the school had opted to offer Technical Vocational Programs such as Associate in Computer Science, Associate in Computer Technology, and Associate in Bookkeeping and Accounting. In the next school years 2003-2004, the school had opened Baccalaureate programs such as Bachelor of Arts in Psychology, Bachelor of Secondary Education major in Guidance and Counseling, Bachelor of Elementary Education with a concentration in Mathematics, and Bachelor of Science in Business Administration major in Management.

As of early May 2021, Colegio de San Gabriel Arcangel (CDSGA) has been affected by the COVID-19 pandemic. The government has rolled out various public health measures, including school closures. CDSGA has also had to adjust to the new normal where face-to-face interaction and mass gatherings are prohibited. Therefore, the school limit the visitors and implement a manual safety prevention gateway for those who have an appointment whereas the guard gets information such as name, address, contact number, and course and assure the visitors have a facemask, checks the body temperature, and sanitizes the hand of visitors to easily trace and limit the spread of the disease. Fortunately, the school accepts a vaccination card to avoid filled-up manually and promotes less hassle before entering the gate.

1.1 Background of the Problem

The outbreak of coronavirus disease (COVID-19) has created a global health crisis that probably pursues the desire to come up with a safety prevention gateway in aid of the pandemic. The concept of making a safety prevention gateway has begun when the first case of novel coronavirus (2019-nCoV, now COVID-19) in the Philippines was confirmed on January 30 when a Chinese woman reached the country from Wuhan, China who was confined at San Lazaro Hospital in Metro Manila, and then a few days later her male companion died of the virus – making it the first recorded death outside of China (Department of Health (DOH), 2020b; Ramzy and May, 2020; World Health Organization (WHO), 2020a). By March 7, the first case of local transmission was confirmed (DOH, 2020a; WHO, 2020a). Since then, the virus has spread to the country's 81 provinces. As a result, the Philippines is one of the most highly impacted in Southeast Asia and the Western Pacific Region so that the National and local

governments have been imposing community quarantines since March 15, 2020, as a measure to limit the spread of the virus. These include the Luzon-wide enhanced community quarantine (ECQ) that was implemented in March-May 2020. On March 24, President Rodrigo Duterte signed the Bayanihan to Heal as One Act, a law that granted him additional powers to handle the pandemic. This was repealed by a follow-up law, the Bayanihan to Recover as One Act, which he signed on September 11. (Retrieved from, https://journals.sagepub.com/doi/full/10.1177/1329878X20953854#_i6. Retrieved date, October 01, 2021).

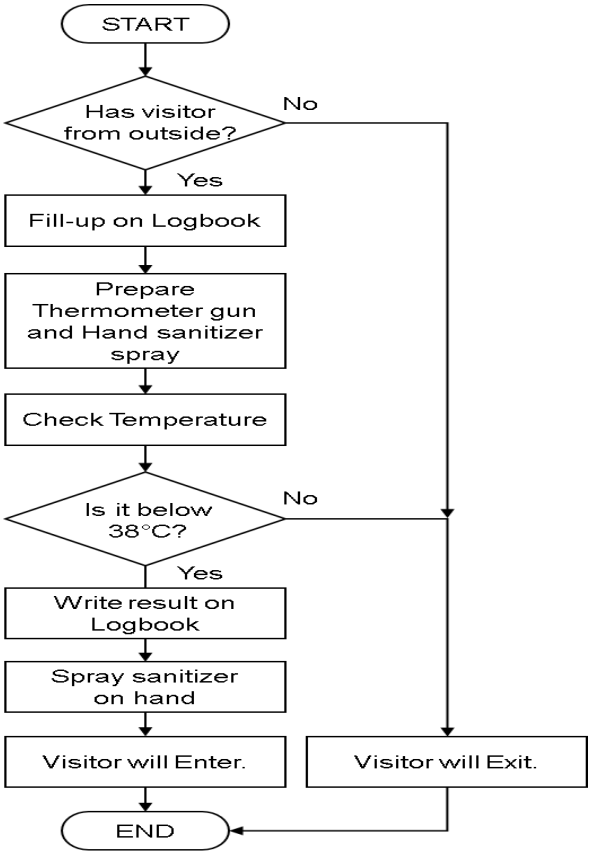


Figure 1.

Current process of accepting CDSGA visitor

The current process of accepting CDSGA visitor is shown in the flow chart above in Figure 1. It explains everything in detail on how the current procedure of accepting visitors manually in school of CDSGA. Thus, the developers aimed to develop a Safety Prevention Gateway: an Arduino-Based Prototype that could record the information and number of visitors, check body temperature and sanitize people automatically. The developers considered the convenience of the devices so that it is easy to use and efficient in securing the safeness of an area like hospitals, workplaces, offices, schools, etc. By having these, there are possibilities to limit the risk of transmissions of Coronavirus.

1.2 Overview of the Current State of the Technology

Since September 11, 2001, many companies and government agencies enhanced building security by including access control and documenting visitors. The most defining event illustrating the need to enhance school security worldwide occurred in Beslan, Russia on September 1, 2004. A group of mostly Chechen terrorists took over a school and held more than 1,100 hostages for three days until Russian security forces stormed the building. A severe firefight ensued and ultimately over 350 people died, including 184 children. Shortly afterwards, Deputy Secretary of Education Eugene W. Hickok issued a policy letter to all U.S. schools listing “a closed campus approach to limit visitors” as one effective measure of enhancing school security. Since then, several new computerized visitor management systems have been introduced to meet this need (Hagan, 2012). In addition to physical barriers limiting school access to one point, schools have discovered the need to improve their process for recording who is

entering and exiting the facility. The basic clipboard method is limiting because it is slow and provides little information other than name and time. Several computer-based systems are available that provide a wealth of information to enhance both security and front office efficiency. Many systems have a kiosk type environment where a visitor essentially checks himself in much like the clipboard method, but the system has the ability to record much more information quickly. This additional information can include a photo of the visitor, the reason he is there, to what location he is going, a time stamp, and more (Hagan, 2012).

According to Zhang (2017) in his article entitled “Development of a Non-contact Infrared Thermometer”, measuring body temperature plays an important role in this kind of pandemic. With the development of modern technology, an infrared thermometer is created which infers temperature from a portion of the thermal radiation is mainly based on the principles of black body radiation to measure the human body's infrared radiation wavelength, followed by the measurement of body temperature, infrared sensors used by it only to absorb the infrared radiation of human body without any emission, which uses passive non-contact measurement methods and can effectively prevent cross-infection of the human body, it is safe and convenient, so the infrared thermometer does not cause harm to the human body (Retrieved from, https://www.atlantis-press.com/article/25892853.pdf. Retrieved date, October 01, 2021). A traditional thermometer which is now being developed and used for measuring body temperature from objects is a high risk for all because of keeping nearly touch that is not long distance from the affected people. Since they're made from glass, mercury thermometers may break easily, allowing toxic mercury to escape. They may also cause cuts or glass splinters if they break. They contain a hazardous substance;

mercury thermometers must be disposed of properly and can't be thrown into the trash. In that case, contactless thermometers can be used everywhere such as in normal places or risky places.

According to the authors Lee, J., Lee, J. Y., Cho, S. M., Yoon, K. C., Kim, Y. J., & Kim, K. G. (2020) on their study entitled," Design of Automatic Hand Sanitizer System Compatible with Various Containers", Demand for hand sanitizers has surged since the coronavirus broke out and spread around the world. Alcohol gel hand sanitizers are usually applied by squirting the sanitizer liquid when one presses a pump with one's hand. This causes many people to come into contact with the pump handle, which increases the risk of viral transmission. Pressing the pump handle is bothersome, and many passes by without disinfecting their hands. Moreover, each person presses the pump handle differently, making it difficult to predict the amount of use and to manage refills and replacements. For this reason, the actual use of hand sanitizers is reduced, which does not help prevent spread of the virus Some hand sanitizers on the market are automatically pumped. However, because sanitizer containers and pump devices are designed to be compatible only between products produced by the same manufacturer, consumers must also repurchase the container for the liquid if they replace the hand sanitizer. Therefore, this paper suggests the design of an automatic hand sanitizer system compatible with various sanitizer containers. With the proposed device, it is possible to avoid many people coming into contact with the pump handle, thus preventing fomite viral transmission and making the use of hand sanitizer much more convenient. Moreover, the system squirts a certain amount of hand sanitizer at all times, making it easy to manage refills and replacement. Furthermore, it can operate compatibly with various designs of sanitizer containers, so consumers do not need

repurchase a container for the liquid if they replace the hand sanitizer. Thus, it is economical and eco-friendly by decreasing waste emissions. The automatic hand sanitizer device proposed by this paper is ultimately expected to contribute to contactless hand disinfection in public places and virus infection prevention. (Retrieved from https://e-hir.org/journal/view.php?doi=10.4258/hir.2020.26.3.243. Retrieve date, November 12, 2021).

According to the authors Tesfaye F., Wondosen S., Shita A., Data L. (n.d) on their study entitled “Smart Boom Gate”, Boom Gate is a bar, or pole pivoted to allow the boom to block vehicular or pedestrian access through a controlled point. Typically, the tip of a boom gate rises in a vertical arc to a near-vertical position. Boom gates are often counterweighted, so the pole is easily tipped. The project is to design and develop the low-cost boom gate for different sectors. In the current situation of our country boom gate is not design and grow in our country. We went to develop a boom gate by low cost but the same quality of boom gates in the market. The boom gate is used to control the security of entrance by using mechatronics. The boom gate has used some sensors for safety and operating the portal. Operation using different ways such as by using a push-button, remote, and mobile app. The primary user of the project is Universities, Hotel, Government Offices, etc. for a smartphone, it uses an android programing language. The microcontroller does the integration of software and hardware component is called Arduino. (Retrieved from https://www.academia.edu/43806775/SMART_BOOM_GATE. Retrieved date, November 12, 2021).

According to the authors Jothibasu M, Aakash B, Shanju Ebanesh K, Gokul Vinayak L., on their study entitled “Automatic Room Monitoring with Visitor Counter

(ARM – VC)", To supersede the old practice of counting the number of people entering and leaving the room one by one ARM-VC can be implemented which keeps an eye on the count of persons in the room. In the small-scale energy conservation might be seen as small quantity, whereas in the large-scale business area like malls, schools, hospitals it is large quantity as the energy is wasted at a large scale. Additionally, adding the extra relays to the system, it can control the lights of a seminar hall at sections, such that if the count is around 10, then the first part alone will be lighted, if the count is around 50, the second part will also be lighted and so on. It reduces the burden of management and helps in conserving energy. (Retrieved from https://www.ijitee.org/wp-content/uploads/papers/v8i7/G5131058719.pdf. Retrieved date, November 13 2021).

Table 1.

List of Studies Presented

Title Presented	Descriptions & Findings	Usage to proposed study
"New school visitor management technologies help keep school safe."	Discusses the importance and some details of having a visitor management system in safeness of schools.	The study will help to be a guide for the development of visitor management system of proponents.
"Development of a Non-contact Infrared Thermometer"	Discusses the major detail in developing contactless temperature measurement. It also has a conclusion on comparison of IR temperature sensor with different temperature sensors.	The study will help for the development of contactless temperature measurement system of proponents. It will also lessen the hustle of choosing the right temperature sensor to use on project.
"Design of Automatic Hand Sanitizer System Compatible with Various Containers"	Discusses about the development of automatic hand sanitizer system that any size of container can fit. It uses a microcontroller with IR sensor.	The study will help for the development of automatic hand sanitizer system of proponents.

Title Presented	Descriptions & Findings	Usage to proposed study
"Smart Boom Gate"	Discusses about the development of a mobile controlled boom gate that rises in a vertical arc to a near-vertical position.	The study will help for the development of Boom gate system of proponents.
"Automatic Room Monitoring with Visitor Counter (ARM – VC)"	Discusses on using a microprocessor to counting the number of people entering and leaving the room using IR sensors, and automatically turn on and off home appliances.	The study will help for the development of visitor counter system of proponents. It gives several ideas on how this will work.

The proponent's project is software and hardware based. It uses the Arduino microcontroller and an installable software application which is a simple visitor management system made using Visual Basic dotNET. The researchers came to the conclusion that this project would be known as the **Arduino-based Safety Prevention Gateway (ASPG)**. The ASPG has the capability of logging the information provided by the visitor. It has a contactless temperature sensor integrated on prototype to monitor a visitor's body temperature and immediately upload the temperature result data to a software application, display and voice-out the temperature value, then a barrier boom will open and automated spray sanitizer will be activated before entering the campus. In the case the school have a maximum number of visitors allowed inside, the ASPG may additionally indicate the number of visitors within the school. This project intends to replace the manual tasks performed by school guards, such as measuring a visitor's body temperature and spraying sanitizer on them by hand, as well as writing a visitor's information in a Logbook.

1.3 Project Rationale

The results and findings of the study will be of great benefit to the following:

Colegio De San Gabriel Arcangel (CDSGA). This study will help the school to strengthen its security and prevent the spread of Coronavirus disease around the school.

CDSGA visitors. This study will help in ensuring the safety, speed, and convenience of students, parents, and guardians, as well as anyone else who has concerns about school in entering the CDSGA campus. It serves as a guide to visitors to not being exposed to virus infection.

School guards. This study will help them concentrate on their duty as a guard instead of doing other tasks like spraying hand sanitizer and checking the temperature manually and help them to finish their tasks quickly.

Proponents. This study is crucial to the researchers since it will help them improve their Computer Engineering abilities in addressing complicated issues when designing hardware and software programming.

Future researchers. This study could serve as an additional reference to their conducting further research related to this study. It will give an idea and information that will help what features they can improve to their prototype.

Computer Engineering Field of Study. This study is beneficial to the field of computer engineering since it highlights the usefulness of their profession, especially as we approach closer to greater technical developments.

Department of Health (DOH). This study will help them monitor the temperature of visitors and lessen the hassle of doing contact tracing in case of a virus infection around the school.

Country. This study will beneficial for the country since safety prevention gateway will reduce the number of cases of infection caused by viruses in the country.

1.4 Problem Statement

How to create an Arduino-based safety prevention gateway prototype?

1.4.1 Specific Problems

1. How to create a module for security?
2. How to create a module for temperature measurement?
3. How to create a module for automated hand sanitizer?
4. How to create a module for barrier boom gate?
5. How to create a module that will count the number of visitor that pass-through Arduino-based safety prevention gateway?
6. What system architecture is proposed in the development of Arduino-based safety prevention gateway?

1.5 Research Project

1.5.1 General Objective

To be able to develop an Arduino-based safety prevention gateway prototype.

The developers aim to create a safety prevention gateway that can record the visitor information, display and voice-out the acquired result of contactless temperature measurement, and automatically sanitize hands thereafter.

1.5.2 Specific Objectives

1. To create a module for security.

   The developers aim to develop a security module, and it is a software application that records and manages the visitor's information that will be connected to prototype.

2. To create a module for temperature measurement.

   The developers aim to develop a contactless temperature measurement module attached to prototype using infrared thermometer sensor to measure the temperature of visitors.

3. To create a module for automated hand sanitizer.

   The developers aim to develop a sensor-based hand sanitizer module that will automatically splash alcohol on visitor's hand when a specified sensor is triggered.

4. To create a module for barrier boom gate.

   The developers aim to develop a barrier boom module that will prevent the visitor to enter in school while the required information is not yet satisfied. It will be controlled automatically or manually using ASPG's software.

5. To create a module that will count the number of visitor that pass-through Arduino-based safety prevention gateway.

The developers aim to develop a sensor-based visitor counter module that will count a number of visitors that comes through, then display the count value in the computer monitor using ASPG's software.

6. To create a system architecture in the development of Arduino-based safety prevention gateway.

The developers aim to develop a system architecture that shows the functionality and working process of Arduino-based safety prevention gateway.

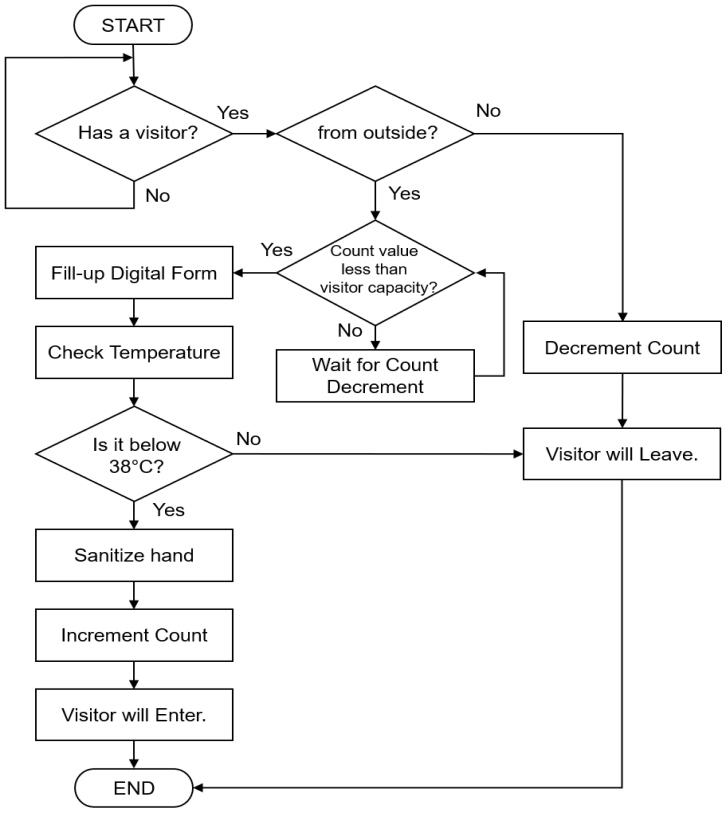


Figure 2.

Process of accepting CDSGA visitor with ASPG

The entire working flow of accepting CDSGA visitor with ASPG is shown in the flow chart above in Figure 2. It thoroughly explains how things function and coding works. It discusses enter and exit gateway case circumstances. This will illustrate the checking of a number of allowed visitors that will come inside the school, storing visitor's information, examining of body temperature, and how it will operate the barrier boom and automated hand sanitizer.

1.5.3 Scope and Limitations

The Arduino-based Safety Prevention Gateway (ASPG) has the following scopes:

1. It is an ASPG that can log information in a short period of time.
2. It can monitor the number of visitors inside of school.
3. It can measure temperature and hand sanitize in contactless.
4. It is an ASPG that can automatically encode the visitor's information, temperature, date and time in the ASPG's software application form.
5. It can produce a ready-to-print document report or save it in a specified file format.

The following are the Limitations of the study:

1. The ASPG can only be used in CDSGA campus.
2. The ASPG's device and ASPG's software application are dependent on each other and can't function properly without one.
3. The ASPG is only for local and it can't be put online.

4. The ASPG's software application can only be installed in Windows operating system.
5. The ASPG can only process one visitor at a time.
6. The Proximity sensor for counting visitor can easily block by any objects.
7. Only Android Phone with supported NFC android beam can do auto fill-up on ASPG's software application.

1.5.4 Methodology

In systems engineering, information systems, and software engineering, the systems development life cycle (SDLC), also referred to as the application development life-cycle, is a process for planning, creating, testing, and deploying an information system. The systems development life cycle concept applies to a range of hardware and software configurations, as a system can be composed of hardware only, software only, or a combination of both. (Retrieved from Wikipedia, https://en.wikipedia.org/wiki/Systems_development_life_cycle. Retrieve date October 5, 2021). There are several models of SDLC like Waterfall, Agile, V-Shaped, Iterative, Spiral, etc. In this project, researchers chose the Waterfall model. This model is straightforward and simple to grasp and apply. Because of the model's rigidity, it is simple to manage. The Waterfall Model of Systems Development Life Cycle (SDLC) depicts the project development process as a linear sequential flow. This indicates that any step of the development process may begin only after the previous phase has been completed. The stages in this waterfall model do not overlap.

According to Zulqadar (2019), "The Waterfall Model is one of the first models introduced in software development, and it has gained popularity because it clearly defines each step, with logical flow of information. It enables developers to know about the requirements in early stages, which guide them throughout the development process. But it is not without constraints; there is no room for frequent changes which increases inflexibility of the model. These shortcomings have given room to alternative approaches and models, such as the Agile Development Model. Selection of the right model is mainly dependent on variables like availability of resources and specifications of the project. The Waterfall Model remains one of the most popular software development models to-date, mostly for small-scale projects, regardless of its shortcomings". (Retrieved from https://rezaid.co.uk/sdlc-waterfall-model/. Retrieved date, November 8, 2021). The researchers chose not to include the maintenance phase for such reason. The developers plan to deploy the project once after repeat it indefinitely until it is perfected throughout the testing phase. As a result, the maintenance phase is no longer required. The sequential phases in the waterfall model that the proponents will carry out are requirement gathering and analysis, system design, implementation, integration and testing, and system deployment. It can be shown below in Figure 3.

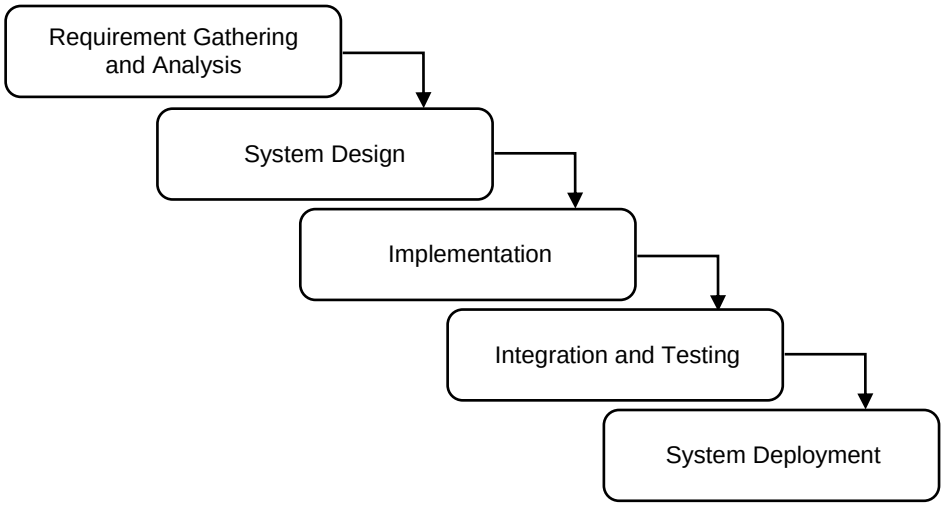


Figure 3.

System Development Life Cycle (SDLC) – Waterfall Model

The first phase is Requirement Gathering and Analysis. This phase captures all feasible needs for the system to be created and documents them in a requirement specification document. It focuses on defining and capturing the needs and problems that a system is to address and solve. The Team held a series of meetings to develop a project concept, determine problems, analyzation of the whole concept. This phase will be setting the stage for the rest of the phases of the prototype development. It is also a thorough and detailed explanation of the behavior of the program that will be built and finalizing the materials and resources that will be used in the prototype's development.

The second phase is System Design. The requirement specifications from first phase are studied in this phase and the system design is prepared. This system design helps in specifying hardware and system requirements and helps in defining the overall system architecture. It is the process of planning and

problem solving for a system solution. It implicates system developers and designers to define the plan for a solution which includes flowchart design, system architecture design, and circuit diagram design, and graphical user interface design. After all the design are made the proponents will purchase the materials that will be used in the prototype's development.

The third phase is Implementation. This phase is where the prototype is being assembled and real code is written and compiled into an operational application, and where the database and software are created. In other words, it is the process of converting the whole requirements and blueprints into a system production environment. The system is developed in small programs called units, after which these units are integrated. Sometimes, functionality of each unit is tested before integration, which is called Unit Testing.

The fourth phase is Integration and Testing. All the units' development in the implementation phase is integrated into a system after testing of each unit. Post integration of the entire system is tested for any faults and failures. It is also known as verification and validation, which is a process for checking that a software solution meets the original requirements and specifications and that it accomplishes its intended purpose. After all, verification is the process of evaluating software to determine whether the system of a given development phase satisfies the conditions imposed at the beginning of that phase, whereas validation is the process of evaluating software during or at the end of the development process to verify that it meets requirements. Furthermore, the testing phase is the outlet for debugging, in which defects and system malfunctions are discovered, rectified, and polished as needed.

The fifth phase is System Deployment. Once the functional and non-functional testing is done, the system is deployed in the user environment. The deployment phase is the final phase of the software development life cycle (SDLC) and puts the system into production. After the project team tests the system and the system passes each testing phase, the system is ready to go live. This means that the system is ready to be used in a real environment by all end users of the system.

System Architecture

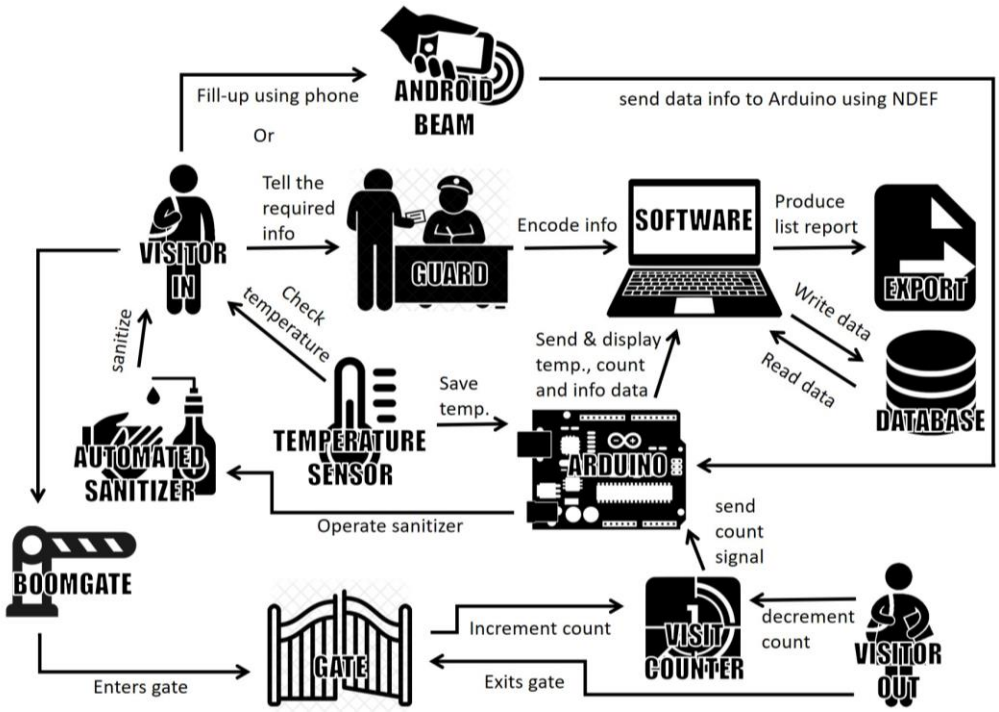


Figure 4.

System Architecture of ASPG

The general behavior of the ASPG project can be shown on Figure 4 above. The flow and process of the whole system is controlled by a microprocessor called Arduino Uno. The system's Boom gate is typically open and will be close when a presence of entering person has detected. At first the visitor trying to enter the gate needed to provide relevant information required by some gatekeeper, or just beam an information thru mobile phone that support an android beam on the device. Arduino Uno will activate the temperature sensor that will check for the body heat of a visitor. Once the temperature has been acquired the automated sanitizer will be initiate no matter if it has a fever or not. All of information that acquired will then transfer to Arduino Uno, it will be sent and display to ASPG software. The system will process the visitor's body heat. If the processed temperature does not above the usual fever value, the Boom gate will open automatically; otherwise, the Boom gate will remain closed and will not allow the guest to enter. Once the visitor succeeded to enter the display counter will be incremented. Visitors attempting to leave the campus may simply walk through the gate, which will cause the counter for visitor to decrease. Leaving will not result in any data collection from the visitor. The ASPG software saves the information collected from visitors to its database, it can freely access its data and display a table on screen. Whenever the collected visitor information is finalized, a ready-to-print document report of visitors who enter the campus may be produced.

CHAPTER 2

PROJECT MANAGEMENT

2.1 Calendar of Activities

2.1.1 Description of Activities

SCHEDULE	ACTIVITY	DESCRIPTION
Phase 1 - Requirement Gathering and Analysis		
September 24 – October 7, 2021	Project Conceptualization	The Team held a series of meetings to develop a project concept.
October 8 – 14, 2021	Determining the General to Specific Problems	Following the selection of the project, collective thinking was used to identify general and specific problems.
October 10 – 21, 2021	Analyzation	Investigating the identified problems and developing various potential solutions.
October 15 – 21, 2021	Giving Solution to Problems Identified	Developing the best adaptation solution while keeping affordability, efficiency, and security in mind.
October 17 –28, 2021	Materials and Resources	Finalizing the hardware parts and software that will be used in the prototype's development.
Phase 2 - System Design		
October 21 – November 08, 2021	Flowcharts	Creating a diagram demonstrating the various phases of a process in chronological sequence.

SCHEDULE	ACTIVITY	DESCRIPTION
November 03 – 15, 2021	Architecture Design	Constructing architectural design of a prototype is used to visualize how it will operate.
November 17 – December 01, 2021	Circuit Diagram	An electrical circuit's components are shown in a simplified manner utilizing images of the various pieces or standard symbols.
December 02 – December 14, 2021	Graphical User Interface Design	Constructing design that illustrates how the software layout application will look like.
January 03 – 24, 2022	Securing materials	The module's materials were purchased by the developers.
Phase 3 - Implementation		
January 25 – February 14, 2022	Materials Check	Manual inspection of bought materials for manufacturing defects.
February 15 – March 31, 2022	Assembly	It took a number of meetings with various groups to finally put the system together. This also covers the programs.
Phase 4 - Integration and Testing		
April 01 – 29, 2022	Prototype Testing	The team took a number of checks and tests on it in order to make sure it's working properly.
Phase 5 - System Deployment		
May 02 – 08, 2022	Installation	Setup of a working prototype at the school's main entrance for testing and demonstration purposes.

2.1.2 Gantt Chart of Activities

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Sep-21	Oct-21				Nov-21				Dec-21				Jan-22	
	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2
Phase 1 - Requirement Gathering and Analysis															
Project Conceptualization		100% Complete													
Determining the General to Specific Problems			100% Complete												
Analyzation				100% Complete											
Giving Solution to Problems Identified				100% Complete											
Materials and Resources					100% Complete										
Phase 2 - System Design															
Flow Charts					100% Complete										
Architecture Design						100% Complete									
Circuit Diagram								100% Complete							
Graphical User Interface Design										100% Complete					
Securing materials															

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Jan-22		Feb-22				Mar-22				Apr-22				May-22	
	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2
Phase 2 - System Design																
Securing materials			100% Complete													
Phase 3 - Implementation																
Materials Check						100% Complete										
Assembly											100% Complete					
Phase 4 - Integration and Testing																
Prototype Testing							100% Complete									
Phase 5 - System Deployment																
Installation											100% Complete					

Legends

Complete

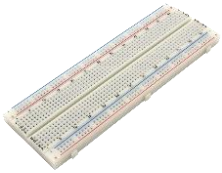
To be accomplished

2.2 Resources

2.2.1 Hardware

Table 2.

Hardware Requirements

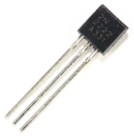
ITEM & DESCRIPTION	SPECIFICATIONS		ILLUSTRATION
Arduino UNO a microcontroller board that can be integrated into a variety of electronic projects.	Microcontroller	ATmega328	
	Operating Voltage	5V	
	Input Voltage (recommended)	7-12V	
	Input Voltage (limits)	6-20V	
	Digital I/O Pins	14 (6 PWM)	
	Analog Input Pins	6	
	DC Current per I/O Pin	40mA	
	DC Current for 3.3V Pin	50mA	
	Flash Memory	32KB	
	SRAM	2KB	
	EEPROM	1KB	
	Clock Speed	16MHz	
	Retrieved from	https://www.farnell.com/datasheets/1682209.pdf	
	Retrieved date	Oct. 15, 2021	
Breadboard used for creating electrical connections between electronic components.	Dimension	6.5x4.4x0.3 inch	
	ABS heat Distortion Temperature	84°C (183°F)	
	Rating	300/3 to 5Amps	
	Insulation Resistance	500MΩ/DC500V	
	Withstanding Voltage	1,000V AC/1 min	
	Insertion Wire Size	21-26 AWG	
	Retrieved from	https://components101.com/misc/breadboard-connections-uses-guide	
	Retrieved date	Oct. 15, 2021	

ITEM & DESCRIPTION	SPECIFICATIONS		ILLUSTRATION
Connection Wire allows an electrical current to travel from one point on a circuit to another	AWG size	24	
	Diameter	0.51054mm	
	Area	0.205mm^2	
	Resistance	84.1976Ω/km	
	Max Current	0.577A	
	Retrieved from	https://www.solaris-shop.com/content/American%20Wire%20Gauge%20Conductor%20Size%20Table.pdf	
	Retrieved date	Oct. 15, 2021	
IR Sensor Module an electronic device used in motion detectors.	Board size	3.2cm x 1.4cm	
	Working voltage	3.3V- 5V	
	Distance range	2 ~ 30cm	
	Detection angle	35°	
	Retrieved from	https://5.imimg.com/data5/YT/KV/MY-1833510/arduino-ir-infrared-obstacle-avoidance-sensor-module.pdf	
	Retrieved date	Oct. 28, 2021	
LED a semiconductor diode which glows when a voltage is applied.	Size	5mm	
	Forward Voltage	3.2V	
	Reverse Current	100μA	
	Luminous Intensity	max-25K min-16.8	
	Power Dissipation	100mW	
	Operation Temperature	-40 ~ +95 °C	
	Retrieved from	https://www.arduino.cc/en/Reference/DataSheets	
	Retrieved date	Oct. 15, 2021	

ITEM & DESCRIPTION	SPECIFICATIONS		ILLUSTRATION
I2C Serial Interface 1602 LCD Module an 16x2 LCD display screen with I2C interface. It is able to display 16x2 characters on 2 lines, white characters on blue background.	Display Type:	Negative white on Blue backlight.	
	I2C Address:	0x38-0x3F	
	Supply voltage:	5V	
	Interface	I2C to 4bits LCD data and control lines.	
	Contrast Adjustment:	built-in Potentiometer.	
	Board Size:	80x36 mm.	
	Retrieved from	http://www.handsontec.com/dataspecs/module/I2C_1602_LCD.pdf	
	Retrieved date	Oct. 28, 2021	
E18-D80NK Infrared Proximity Sensor a non-contact detection sensor providing a digital output when an object comes into a specific range of it.	Quantity needed:	2 pcs.	
	Product code:	E18-D80NK	
	Sensing range:	3-80 cm	
	Input Voltage:	5V	
	Current Consumption:	25-100 mA	
	Response time:	<2ms	
	Retrieved from	https://components101.com/sensors/e18-d80nk-infrared-proximity-sensor-pinout-features-datasheet-alternative-working	
	Retrieved date	Oct. 28, 2021	
PN532- NFC RFID Module basically, used to setup a communication mode to devices for quick data exchange.	Operating voltage:	+2.7V to +5.5V	
	Contactless communication at	13.56MHz	
	Supported Interfaces:	HSU, I2C and SPI	
	Operating Temperature	-30ºC to +85ºC	
	Retrieved from	https://components101.com/wireless/pn532-nfc-rfid-module	
	Retrieved date	Oct. 15, 2021	

ITEM & DESCRIPTION	SPECIFICATIONS		ILLUSTRATION
Resistor an electrical device that resists the flow of electrical current.	Resistance Value	1kΩ & 220Ω	
	Tolerance Value	±5%	
	Temperature Range	-55°C ~ +235°C	
	Retrieved from	http://arduino.cc/documents/datasheets/Resistors.pdf	
	Retrieved date	Oct. 15, 2021	
Serial MP3 playback module with 1W speaker simple MP3 player device which is based on a high-quality MP3 audio chip.	Product code:	HCMODU0138	
	Supports file formats:	MP3 / WAV	
	Working voltage:	3.7 - 5.25VDC	
	Baud Rate:	9600bps	
	Supports Micro SD	up to 2GB	
	Supports Micro SDHC	up to 32GB	
	Retrieved from	https://forum.hobbycomponents.com/viewtopic.php?t=2893	
	Retrieved date	Oct. 28, 2021	
Servo motor an electromechanical device that produces torque and velocity based on the supplied current and voltage.	Type	MG996R	
	Operating Voltage	+5V	
	Torque	9.4 kg/cm	
	Operating speed	0.17s/60°	
	Gear Type	Metal	
	Rotation	0°-180°	
	Weight of motor	55mg	
	Retrieved from	https://components101.com/motors/mg996r-servo-motor-datasheet	
	Retrieved date	Oct. 28, 2021	

ITEM & DESCRIPTION	SPECIFICATIONS		ILLUSTRATION
DC Mini Submersible Water Pump mini water pump for fountain garden mini water circulation system.	Voltage:	2.5-6V	
	Flow rate:	80-120L/H	
	Material:	Engineering Plastic	
	Retrieved from	https://5.imimg.com/data5/IQ/GJ/PF/SELLER-1833510/dc-mini-submersible-water-pump.pdf	
	Retrieved date	Oct. 28, 2021	
Peristaltic Pump Silicone Tube used to carry fluids.	Length:	1m	
	Size:	8x5mm	
	Material:	Food Grade Silicone	
	Color:	Transparent	
	Retrieved date	Oct. 28, 2021	
KY-016 Full Color RGB LED emits a wide range of different colors by mixing red, green and blue light.	Operating Voltage	5V	
	LED Drive Mode	Common cathode drive	
	LED Diameter	5mm	
	Board Size	15mm x 19mm	
	Retrieved from	https://arduinomodules.info/ky-016-rgb-full-color-led-module/	
	Retrieved date	Oct. 28, 2021	
Temperature Sensor an infrared thermometer for non-contact temperature measurements.	Type	GY-906 MLX90614	
	Supply Voltage	+5V	
	Temperature range	-40 to 125°C	
	Measurement resolution	0.02°C	
	Retrieved from	https://www.sparkfun.com/datasheets/Sensors/Temperature/MLX90614_rev001.pdf	
	Retrieved date	Oct. 28, 2021	

ITEM & DESCRIPTION	SPECIFICATIONS		ILLUSTRATION
PN2222 a conjoint NPN bipolar junction transistor.	Collector-Emitter Max Voltage	30VDC	
	Collector-Base Max Voltage	60VDC	
	Emitter-Base Max Voltage	5VDC	
	Collector Max Current	600mA	
	Retrieved from	http://users.ece.utexas.edu/~valvano/Datasheets/PN2222-D.pdf	
	Retrieved date	Oct. 28, 2021	
Ultra-Sonic Sensor an instrument that measures the distance to an object using ultrasonic sound waves.	Type	HC-SR04	
	Operating Voltage	+5V	
	Measuring Distance	2 - 80cm	
	Accuracy	3mm	
	Measuring Angle Covered	<15°	
	Operating Current	<15mA	
	Operating Frequency	40Hz	
	Retrieved from	https://components101.com/sensors/ultrasonic-sensor-working-pinout-datasheet	
	Retrieved date	Oct. 28, 2021	
Laptop Computer a programmable device for processing, storing, and displaying information.	Windows® 7(x86 & x64) or later. 384 MB of RAM or more 2.2 GB of available hard-disk space.		
	Retrieved date	Oct. 15, 2021	
Expandable Rod	Extendable Length	2m	
	Material:	Stainless Steel	
	Retrieved date	Oct. 15, 2021	

ITEM & DESCRIPTION	SPECIFICATIONS		ILLUSTRATION
Power Supply Adapter	Input power:	AC 110-240V 50/60HZ.	
	Output:	DC 12V 3000mA	
	Retrieved date	Oct. 15, 2021	
Grey Cardboards	Density	300GSM - 2600GSM	
	Thickness	4mm	
	Coating	Double sides uncoated gray	
	Retrieved date	Oct. 15, 2021	
Plastic Bottle	Volume	1.5 Liter	
	Retrieved date	Oct. 15, 2021	

2.2.2 Software

Table 3.

Software Requirements

SOFTWARE NAME	DESCRIPTION	ILLUSTRATION
Arduino Integrated Development Environment (IDE)	Arduino IDE (Integrated Development Environment) is the software for Arduino. It is a text editor like a notepad with different features. It is used for writing code, compiling the code to check if any errors are there and uploading the code to the Arduino. https://botsolvers.com/what-is-arduino-ide-and-its-different-functions/ Retrieved Oct. 31, 2021	
Microsoft Visual Studio	Microsoft Visual Studio is an IDE made by Microsoft and used for different types of software development such as computer programs, websites, web apps, web services, and mobile apps. It contains completion tools, compilers, and other features to facilitate the software development process. https://www.incredibuild.com/integrations/visual-studio Retrieved date Oct. 31, 2021	
MySQL	MySQL is an Oracle-backed open-source relational database management system (RDBMS) based on Structured Query Language (SQL). https://searchoracle.techtarget.com/definition/MySQL Retrieved date Oct. 31, 2021	
XAMP	It is a platform that furnishes a suitable environment to test and verify the working of projects based on Apache, Perl, MySQL database, and PHP through the system of the host itself. https://www.javatpoint.com/xampp Retrieved date Oct. 31, 2021	

CHAPTER 3

PERFORMANCE ANALYSIS

This section will present the findings of the research testing and experimentation, followed by an analysis of the data acquired and the collected study outcomes.

3.1 Introduction

The project intends to replace the manual tasks performed by school guards, such as measuring a visitor's body temperature and spraying sanitizer on them by hand, as well as writing a visitor's information in a Logbook before the visitor is allow to go inside the school. The major objective of this experiment is to determine whether the Arduino-based Safety Prevention Gateway can speed up the procedure of visitors entering a campus and correctness in device of functionality. One of the most prominent advantages of an automated system is its dependability, which reduces human mistakes and saves time, which the experiment will focus on.

3.2 Experimental

3.2.1 Research Instrument

The researchers chose a survey questionnaire to collect information in this study. Questionnaires are provided to chosen respondents who often visit the CDSGA campus such as students, parents, or staff at school. Before answering the survey, the selected respondents will test the ASPG device.

Furthermore, the researchers acknowledged other ideas from the respondents and will be recorded for the improvement of the study.

3.2.2 Validation of Instrument

The developers choose 20 respondents who often visit the CDSGA campus such as students, parents, or staff at school. Survey questionnaires were prepared and distributed to gather information on user satisfaction with the Arduino-based Safety Prevention Gateway.

3.2.3 Data Gathering Procedure

The data gathering procedure is done by the developers. This was split into two parts. First is the primary data which is a main source of information obtained by developers through survey questionnaires filled out by respondents. Second, secondary data acquired via group discussions, observations, experiments, consultation, recommendation, recommendations, ideas, and more that acts as extra information necessary for the study's improvement. All of the data gathered will be used to make updates and enhancements to the Arduino-based Safety Prevention Gateway.

3.2.4 Statistical Analysis

The researchers used qualitative research to gain insights into the study's context. The survey results from the various respondents were statistically collated and tallied.

The Average Score of each questions will be computed using the equation below.

$$\bar{x} = \frac{x_1 + x_2 + \cdots + x_n}{n}$$

Where:

$\bar{x}$ = Average score
x_n = Each respondents score for the question
n = Total number of respondents

The overall computation of a factors such as accuracy, reliability, and user-friendly will be computed with the same equation for Average Score.

Where:

$\bar{x}$ = Overall score of factor
x_n = Average score of questions
n = Total number of questions

3.2.5 Implementation

This section refers to the setting or location where data is collected at Area E, Sapang Palay, City of San Jose Del Monte, Bulacan. In this study, data were gathered at the Colegio de San Gabriel Arcangel Campus, where individuals are frequent visitors of the school.

3.3 Results and Analysis

Table 4.

Numerical Range and Remarks Interpretation for the satisfaction of ASPG

SCORE	REMARKS
4.50 – 5.00	Very Satisfied
3.50 – 4.49	More than Satisfied
2.50 – 3.49	Satisfied
1.50 – 2.49	Partly Satisfied
1.00 – 1.49	Not at all Satisfied

Table 5.

Evaluation of the ASPG in terms of Accuracy

	Average	Remarks
1. Accuracy		
1.1 Correctness of the system in determining the visitor's body temperature.	2.45	Partly Satisfied
1.2 Correctness of the system in counting visitors.	4.55	Very Satisfied
1.3 The system's correctness in terms of the amount of alcohol produced.	4.15	More than Satisfied
Overall Accuracy	3.7167	More than Satisfied

As shown in Table 4, the respondents answered the following questions with the mean ranges of 3.8 to 4.55, respectively. The weighted mean is 4.167, indicating that the Accuracy of Arduino-based Safety Prevention Gateway is More than Satisfied.

Table 6.

Evaluation of the ASPG in terms of Reliability

	Average	Remarks
2. Reliability		
2.1 The system's ability to process each visitor quickly.	4.4	More than Satisfied
2.2 Correctness of the system in recording visitor's information.	4.85	Very Satisfied
2.3 The system's ability in terms of contact tracing.	4.9	Very Satisfied
Overall Accuracy	4.7167	Very Satisfied

As shown in Table 5, the respondents answered the following questions with the mean ranges of 4.4 to 4.9, respectively. The weighted mean is 4.7167, indicating that the Reliability of Arduino-based Safety Prevention Gateway is Very Satisfied.

Table 7.

Evaluation of the ASPG in terms of User-Friendly

	Average	Remarks
3. User-Friendly		
3.1 The easiness of using the system.	4.35	More than Satisfied
3.2 The safeness of using the system.	4.7	Very Satisfied
3.3 The quality of generated document from system software.	4.95	Very Satisfied
Overall Accuracy	4.67	Very Satisfied

As shown in Table 5, the respondents answered the following questions with the mean ranges of 4.35 to 4.95, respectively. The weighted mean is 4.67, indicating that the User-Friendly of Arduino-based Safety Prevention Gateway is Very Satisfied.

3.4 Summary

Based on the findings of the data collection and analysis, the researchers find the following conclusions and interpretations:

1. The respondents gave a partly satisfied remarks in terms of correctness of the system in determining the visitor's body temperature that has a weighted mean 2.45 out of 5.00. The respondents gave a very satisfied remarks in terms of correctness of the system in counting visitors that has a weighted mean 4.55 out of 5.00. The respondents gave a very satisfied remarks of the system's correctness in terms of the amount of alcohol produced that has a weighted mean 4.15 out of 5.00.

2. The respondents gave a more than satisfied remarks in terms of the system's ability to process each visitor quickly that has a weighted mean 4.4 out of 5.00. The respondents gave a very satisfied remarks in terms of correctness of the system in recording visitor’s information that has a weighted mean 4.85 out of 5.00. The respondents gave a very satisfied remarks of the system's ability in terms of contact tracing that has a weighted mean 4.9 out of 5.00.

3. The respondents gave a partly satisfied remarks in terms of easiness of using the system that has a weighted mean 2.35 out of 5.00. The respondents gave a very satisfied remarks in terms of safeness of using the system that has a weighted mean 4.7 out of 5.00. The respondents gave a very satisfied remarks of quality of generated document from system software produced that has a weighted mean 4.95 out of 5.00.

CHAPTER 4

CONCLUSION AND RECOMMENDATION

This section will include the conclusion of the study containing the summary of the problem and the recommendations for potential development for future research consideration.

4.1. Conclusion

In this paper, the goal of the study was to implement an Arduino-based Safety Prevention Gateway in CDSGA. The designed system successfully monitors the users by recording the number of visitors, checking body temperature, and sanitizing people. According to the observation and discussions, it can be said that both software and the hardware synced together and performed 75% and above by having different testing and experiments conducted. The only problem is the accuracy of the temperature does not compatible with the normal temperature of a person. Every test must be at least can range between 36.1 C and 37.2 C for a normal rate for an individual. However, the project's main aim is to give an accurate monitoring for supervising the health of the body whether fever occurs or not so the developers implemented a solution for the various problems. To enable the correct accuracy of a temperature, the developers change the program code to function well. The developers successfully demonstrated the said functionality, which was conclusively proven and accomplished.

In the future, the designed system will be tested with more people to learn more about the pros and cons of the system. The obtained measurements from various people can support the project in developing the device in terms of temperature

precision, which are really useful not only in the case of COVID quarantine, but also medical care in general.

4.2. Recommendation

Furthermore, the proposed study should be enhanced based on its limitations, findings, and conclusion:

1. The proposed system can be improved by using the most accurate temperature sensor to avoid misinformation of data.
2. The proposed system can be improved by having LED lights inside the box to see and put the hands properly.
3. The proposed system can be improved by putting it online and not only for local.
4. The proposed system can be improved by lessening the amount of alcohol produced to avoid overconsumption of alcohol.
5. The proposed system can be improved by listing the visitors with the high temperature only.

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APENDICES

APENDIX A

System Evaluation Questionnaire

Direction: Please check the corresponding points for each question's checkbox.

QUESTIONS	5pts. (Excellent)	4pts. (very good)	3pts. (good)	2pts. (fair)	1pts. (poor)
1. Accuracy					
1.1 Correctness of the system in determining the visitor's body temperature.					
1.2 Correctness of the system in counting visitors.					
1.3 The system's correctness in terms of the amount of alcohol produced.					
2. Reliability					
2.1 The system's ability to process each visitor quickly.					
2.2 Correctness of the system in recording visitor's information.					
2.3 The system's ability in terms of contact tracing.					
3. User-Friendly					
3.1 The easiness of using the system.					
3.2 The safeness of using the system.					
3.3 The quality of generated document from system software.					

APENDIX B

System Evaluation Results

Responses of Respondent 1 to Respondent 10.

Q	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
1.1	2	2	2	1	2	3	2	4	3	2
1.2	5	4	4	5	5	4	5	5	4	5
1.3	5	4	4	4	3	5	4	4	3	4
2.1	5	5	5	4	5	5	4	5	4	4
2.2	5	5	5	5	5	5	5	5	5	4
2.3	5	5	5	4	5	5	5	5	5	5
3.1	4	5	4	3	4	5	4	5	5	5
3.2	5	4	5	5	5	4	4	5	4	5
3.3	5	5	5	5	5	4	5	5	5	5

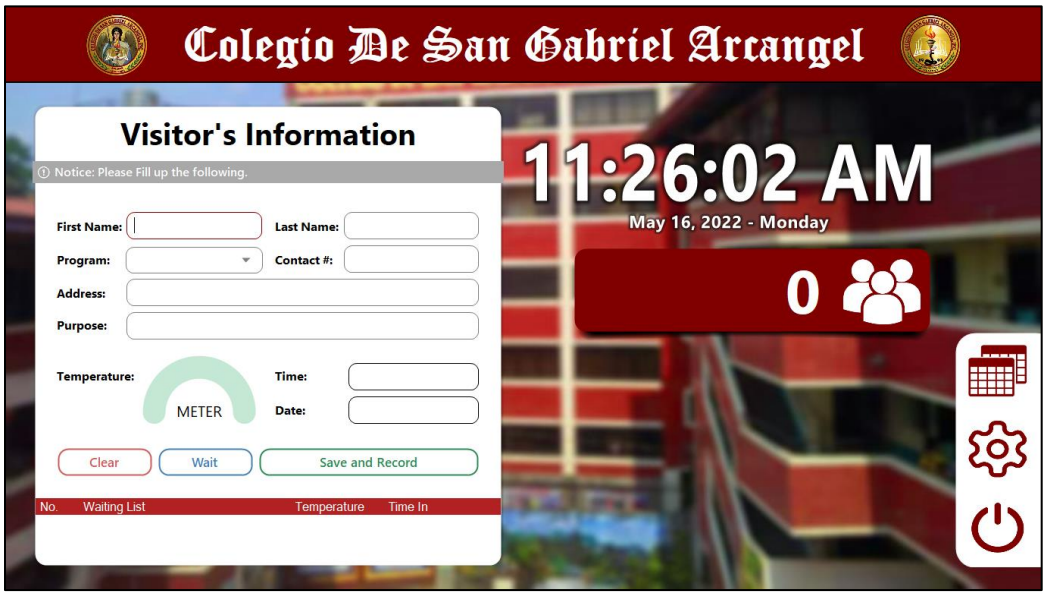
Responses of Respondent 11 to Respondent 20.

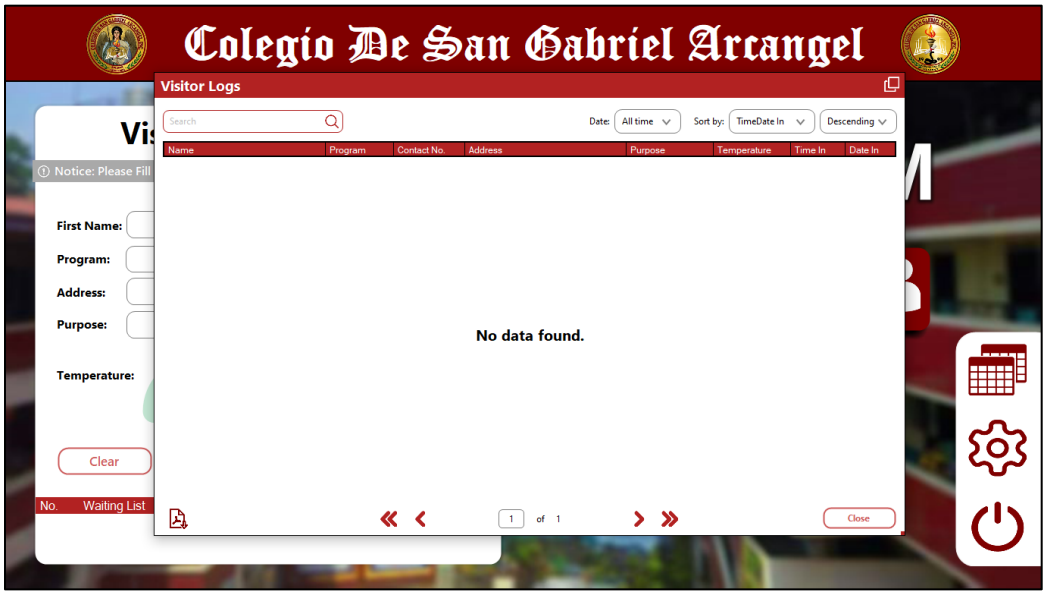
Q	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20
1.1	2	3	2	4	2	4	3	2	1	3
1.2	5	4	4	5	5	4	4	4	5	5
1.3	4	5	4	4	5	3	4	5	4	5
2.1	3	4	5	5	3	5	4	5	4	4
2.2	4	5	5	5	5	4	5	5	5	5
2.3	5	5	5	5	5	5	4	5	5	5
3.1	4	4	4	4	5	4	5	5	4	4
3.2	5	5	5	5	4	5	5	5	4	5
3.3	5	5	5	5	5	5	5	5	5	5

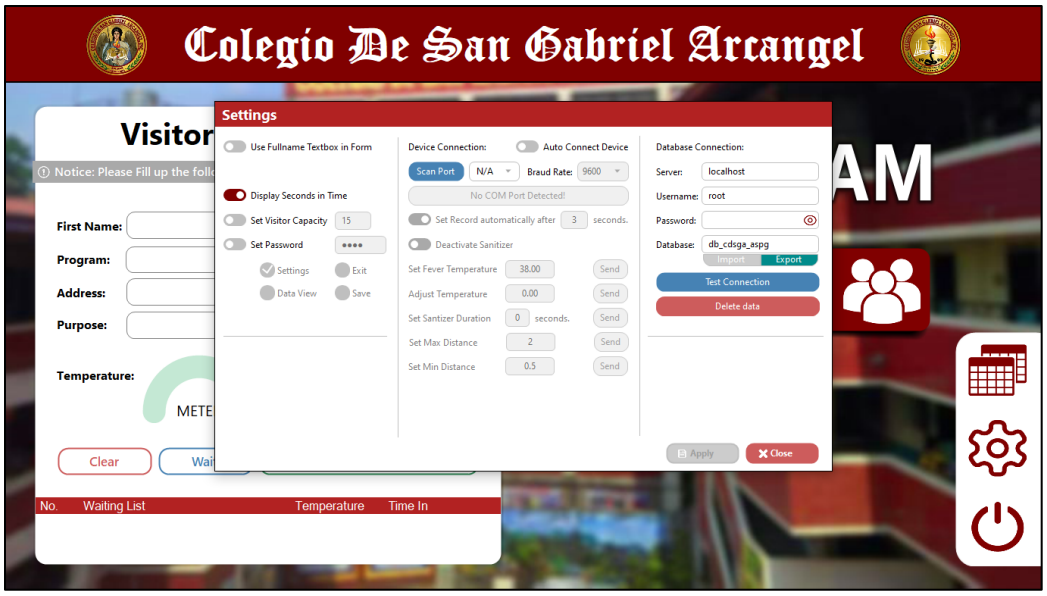
APENDIX C

System Screen Shots (User Interface)

ASPG Software






Colegio De San Gabriel Arcangel
Visitor
Notice: Please Fill up the follo
First Name:
Program:
Address:
Purpose:
Temperature:
Clear
No.
Waiting List
Temperature
Time In
Settings
Use Fullname Textbox in Form
Display Seconds in Time
Set Visitor Capacity
15
Set Password
Settings
Exit
Data View
Save
Device Connection:
Auto Connect Device
Scan Port
N/A
Braud Rate:
9600
No COM Port Detected!
Set Record automatically after
3
seconds.
Deactivate Sanitizer
Set Fever Temperature
38.00
Adjust Temperature
0.00
Set Santizer Duration
0
seconds.
Set Max Distance
2
Set Min Distance
0.5
Send
Database Connection:
Server:
localhost
Username:
root
Password:
Database:
db_cdsga_aspg
Import
Export
Test Connection
Delete data
Apply
Close
AM

APENDIX D

System Source Code

Arduino Uno

```
#include <Wire.h>                       // Dependency library of I2C interface libraries.
#include <HCMP3.h>                      //Arduino library for HCMODU0138
#include <LiquidCrystal_I2C.h>          //Arduino library for LCD I2C interface.
#include <Adafruit_MLX90614.h>          //Arduino library to support I2C MLX90614
#include <millisDelay.h>                //Arduino library for Non-blocking flow of code.
#include <HCSR04.h>                     //Arduino library for HCSR04 Ultrasonic Sensor.
#include <Servo.h>                      //Arduino library for controlling servo motors.
#include <SPI.h>                        //Dependency library of PN532_SPI.h
#include <PN532_SPI.h>                  //Arduino library for PN532 in SPI Interface
#include <snep.h>                       //Dependency library of PN532_SPI.h
#include <NdefMessage.h>                //Dependency library of PN532_SPI.h

#define pinTX 2
#define pinRX 3
#define pinEcho 4
#define pinTrig 5
#define pinServo 6
#define pumpMotor 7
#define palmSensor 8
//#define pin 9   - Used by PN532
#define pinNFC 10
//#define pin 11 - Used by PN532
//#define pin 12 - Used by PN532
//#define pin 13 - Used by PN532
#define pinVstrCntR 14
#define pinVstrCntL 15
#define pinLEDr 16
#define pinLEDg 17
//#define pin 18 - Can't Use due to I2C
//#define pin 19 - Can't Use due to I2C

#define tempAbsAdjusted 0.0
#define tempScanSize 3
#define tempScanMin 1

UltraSonicDistanceSensor distanceSensor(pinTrig, pinEcho);
LiquidCrystal_I2C lcd(0x27,16,2);
Adafruit_MLX90614 mlx = Adafruit_MLX90614();
HCMP3 hcmp3(pinRX, pinTX);
millisDelay waitLoop,waitPump,waitVoice,waitVstrCntR,waitVstrCntL;
Servo barrierBoom;

PN532_SPI pn532spi(SPI, pinNFC);
SNEP nfc(pn532spi);
uint8_t ndefBuf[128];

long waitPumpDuration = 1500;
//double new_emissivity = 1.00;
byte tempSymbol[] = { 0x0E,0x0A,0x0A,0x0E,0x1F,0x1F,0x0E,0x00 };
double tempScanCount[tempScanSize];
double tempAcquired = 0, tempAdjusted = 0, tempFever = 37.50;
double tempDistanceMax = 0.35, tempDistanceMin = 0.1;
int tempStep = 0,tempWXYZ,tempWX,tempX,tempYZ,tempZ;

String rawLine;

bool vstrCntRState;                     //Current state of the Right IR-Sensor
bool isVstrCntRTrigered;                //Anti bouncing for the Right IR-Sensor
```

```
bool lastVstrCntRState;                    //Previous state of the Right IR-Sensor
bool vstrCntLState;                        //Current state of the Left IR-Sensor
bool isVstrCntLTrigered;                   //Anti bouncing for the Left IR-Sensor
bool lastVstrCntLState;                    //Previous state of the Left IR-Sensor
bool isVstrCntRTrigeredDenied;
bool isVstrCntFull = false;

void setup() {
  lcd.init();                              //Initialize LCD
  lcd.createChar(0, tempSymbol);           //Create Custom Char for temperature symbol
  lcd.home();
  lcd.print("Starting...");
  lcd.backlight();

  hcmp3.reset();
  hcmp3.volume(10);                        //Set Volume of Speaker at 10
  hcmp3.play(2,35);                        //Play "System Initializing" audio

  pinMode(pinLEDg, OUTPUT);
  pinMode(pinLEDr, OUTPUT);
  digitalWrite(pinLEDr,HIGH);
  digitalWrite(pinLEDg,HIGH);

  pinMode(pumpMotor, OUTPUT);
  pinMode(palmSensor, INPUT);

  pinMode(pinVstrCntR, INPUT);
  pinMode(pinVstrCntL, INPUT);
  vstrCntRState = digitalRead(pinVstrCntR);
  lastVstrCntRState = vstrCntRState;
  vstrCntLState = digitalRead(pinVstrCntL);
  lastVstrCntLState = vstrCntLState;

  delay(700);                              //Wait 0.7 seconds

  clearRowLCD(1);
  lcd.setCursor(0,1);
  lcd.print("Serial");                     //Display a text on LCD
  Serial.begin(9600);                      //Start serial communication at 9600bps
  delay(700);                              //Wait 0.7 seconds
  if (!Serial) {
    clearRowLCD(0);
    printError();
  }

  clearRowLCD(1);
  lcd.setCursor(0,1);
  lcd.print("IR sensor");                  //Display a text on LCD
  delay(700);                              //Wait 0.7 seconds
  if ((digitalRead(pinVstrCntR) == LOW) ||
      (digitalRead(pinVstrCntL) == LOW)) {
    clearRowLCD(0);
    printError();
  }

  clearRowLCD(1);
  lcd.setCursor(0,1);
  lcd.print("MLX sensor");                 //Display a text on LCD
  delay(700);                              //Wait 0.7 seconds
  if (!mlx.begin()) {
    clearRowLCD(0);
    printError();
  }

  clearRowLCD(1);
  lcd.setCursor(0,1);
```

```
  lcd.print("Servo Motor");                    //Display a text on LCD
  delay(700);                                  //Wait 0.7 seconds
  barrierBoom.attach(pinServo);
  barrierBoom.write(90);
  delay(700);                                  //Wait 0.7 seconds

  lcd.clear();
  lcd.print("Device Ready");
  hcmp3.play(2,37);                            //Play sound fx audio

  delay(700);                                  //Wait 0.7 seconds
  lcd.home();
  lcd.print("Temperature:");

  tempScanCount[0] = 0;
  waitLoop.start(350);                         //Start Start timer with n milliseconds
  waitVstrCntR.start(100);                     //Start Start timer with n milliseconds
  waitVstrCntL.start(100);                     //Start Start timer with n milliseconds
}

void loop() {
  if (Serial.available() > 0) {                //Check if there is a Message from Software
    rawLine = Serial.readString();             //Read and save the Message
    if (rawLine == "vCountf1") {
      isVstrCntFull = true;
    }else if (rawLine == "vCountf0") {
      isVstrCntFull = false;
    }else if (rawLine.startsWith("tempF")) {
      tempFever = rawLine.substring(5).toDouble();
      hcmp3.play(2,33);                        //Play "Settings has been changed" audio
    }else if (rawLine.startsWith("tempA")) {
      tempAdjusted = rawLine.substring(5).toDouble();
      hcmp3.play(2,33);                        //Play "Settings has been changed" audio
    }else if (rawLine.startsWith("pumpD")) {
      waitPumpDuration = rawLine.substring(5).toInt();
      hcmp3.play(2,33);                        //Play "Settings has been changed" audio
    }else if (rawLine.startsWith("tempH")) {
      tempDistanceMax = rawLine.substring(5).toInt();
      hcmp3.play(2,33);                        //Play "Settings has been changed" audio
    }else if (rawLine.startsWith("tempL")) {
      tempDistanceMin = rawLine.substring(5).toInt();
      hcmp3.play(2,33);                        //Play "Settings has been changed" audio
   }
  }

  readVisitor();                               //Call readVisitor() method every loop

  if (waitPump.justFinished()) digitalWrite(pumpMotor,LOW);          //Stop Sanitizer After n ms

  if (waitLoop.justFinished()) {
    if (isVstrCntFull) {                       //Do if isVstrCntFull is True
      digitalWrite(pinLEDr,LOW);
      digitalWrite(pinLEDg,LOW);
      lcd.clear();
      lcd.print("Full Vstr Count");
    }else if ((tempStep == 0) && (digitalRead(palmSensor) == LOW) &&
    (distanceSensor.measureDistanceCm() >= tempDistanceMin) &&
    (distanceSensor.measureDistanceCm() <= tempDistanceMax)) {
     if (tempScanCount[0] == 0) {
        tempScanCount[0] = mlx.readObjectTempC();     //read temperature
        if (tempScanCount[0] >= 45 && tempScanCount[0] <= 20) tempScanCount[0] = 0;
        tempScanCount[1] = 0;
        hcmp3.play(2,39);                      //Play sound fx audio
      }else if (tempScanCount[1] == 0) {
        tempScanCount[1] = mlx.readObjectTempC();     //read temperature
        if (tempScanCount[1] >= 45 && tempScanCount[1] <= 20) tempScanCount[1] = 0;
```

```
    tempScanCount[2] = 0;
    hcmp3.play(2,39);                                   //Play sound fx audio
   }else if (tempScanCount[2] == 0) {
    tempScanCount[2] = mlx.readObjectTempC();           //read temperature
    if (tempScanCount[2] >= 45 && tempScanCount[2] <= 20) tempScanCount[2] = 0;
    hcmp3.play(2,39);                                   //Play sound fx audio
   }else if (abs(tempScanCount[0] - tempScanCount[1]) < tempScanMin &&
          abs(tempScanCount[1] - tempScanCount[2]) < tempScanMin &&
          abs(tempScanCount[2] - tempScanCount[0]) < tempScanMin) {

    tempAcquired = (tempScanCount[0] + tempScanCount[1] +
                tempScanCount[2]) / 3;                  //Set average of temperature samples
    tempAcquired += (tempAdjusted + tempAbsAdjusted);           //Apply Settings adjustment to aquired temp

    digitalWrite(pumpMotor,HIGH);                       //Start Sanitizer
    waitPump.start(waitPumpDuration);                   //Set Sanitizer duration

    tempWXYZ = tempAcquired * 100;                      //temperature value, wxyz digit (in wx.yz dgC)
    tempWX = tempWXYZ / 100;                            //temperature value, wx digit (in wx.yz dgC)
    tempX = tempWX % 10;                                //temperature value, x digit (in wx.yz dgC)
    tempYZ = tempWXYZ % 100;                            //temperature value, yz digit (in wx.yz dgC)
    tempZ = tempYZ % 10;                                //temperature value, z digit (in wx.yz dgC)
    tempAcquired = tempWXYZ * 0.01;                     //temperature value, wx.yz digit (in wx.yz dgC)

    Serial.print("1;");                                 //Send data to_
    Serial.println(tempAcquired);                       //_ASPG Software

    if (tempAcquired >= tempFever) {                    //Change LED indicator to red if True
      digitalWrite(pinLEDr,HIGH);
      digitalWrite(pinLEDg,LOW);
    }
    else {                                              //Change LED indicator to Green
      digitalWrite(pinLEDr,LOW);
      digitalWrite(pinLEDg,HIGH);
    }

    lcd.setCursor(8,1);
    lcd.write(0);
    lcd.print(tempWX);
    lcd.print(".");
    if((tempYZ/10) == 0) lcd.print(0);
    lcd.print(tempYZ);
    lcd.print("\337C");

    tempStep++;
    hcmp3.play(2,32);                                   //Play "Your Temperature is" audio
    waitVoice.start(1760);
   }else{
    tempScanCount[0] = 0;
    hcmp3.play(2,38);                                   //Play audio
   }
  }
  waitLoop.repeat();                                    //Rerun timer
}

if(waitVoice.justFinished()) {
  tempStep++;
  if(tempStep == 2) {
    speak(tempWX,true,true);
  }else if(tempStep == 3) {
    if((tempX!=0)&&(tempWX>19)) {
      speak(tempX, false, false);
    }else{
      waitVoice.start(10);                              //Start Start timer with n milliseconds
    }
  }else if(tempStep == 4) {
```

```
    hcmp3.play(2,30);                                   //Play "Point" audio
    waitVoice.start(303);
  }else if(tempStep == 5) {
    speak(tempYZ, true, true);
  }else if(tempStep == 6) {
    if ((tempZ != 0)&&((tempYZ < 9)||(tempYZ > 19))) {
      speak(tempZ, false, false);
    }else{
      waitVoice.start(10);                              //Start Start timer with n milliseconds
    }
  }else if(tempStep == 7) {
    hcmp3.play(2,31);                                   //Play "Degree Celsius" audio
    waitVoice.start(1952);                              //Start Start timer with n milliseconds
  }else if(tempStep == 8) {
    lcd.clear();
    lcd.print("Scanning...info");
    int msgSize = nfc.read(ndefBuf, sizeof(ndefBuf), 3000);          //Read Ndef message from phone for 3s
    if (msgSize > 0) {
       NdefMessage msg  = NdefMessage(ndefBuf, msgSize);
       NdefRecord record = msg.getRecord(0);
       int payloadLength = record.getPayloadLength();
       byte payload[payloadLength];
       record.getPayload(payload);

       int startChar = 0;
       if (record.getTnf() == TNF_WELL_KNOWN && record.getType() == "T") {
         startChar = payload[0] + 1;
       } else if (record.getTnf() == TNF_WELL_KNOWN && record.getType() == "U") {
         startChar = 1;
       }
       String payloadAsString = "";
       for (int c = startChar; c < payloadLength; c++) {
         payloadAsString += (char)payload[c];
       }
       Serial.print("3;");                                //Send VstrInfo to_
       Serial.println(payloadAsString);                   //_ASPG Software for auto fill-up
    }
    if (tempAcquired >= tempFever) {
      barrierBoom.write(0);
    }
    else {
      barrierBoom.write(90);
    }
    waitVoice.start(500);
  }else{
    Serial.flush();
    lcd.clear();
    lcd.print("Temperature");
    hcmp3.reset();

    digitalWrite(pinLEDr,HIGH);
    digitalWrite(pinLEDg,HIGH);

    waitLoop.start(500);
    waitVstrCntR.start(100);
    waitVstrCntL.start(100);
    tempScanCount[0] = 0;
    tempScanCount[1] = 0;
    tempScanCount[2] = 0;
    tempStep = 0;
  }
 }
}

void readVisitor(){
  vstrCntRState = digitalRead(pinVstrCntR);
```

```
  vstrCntLState = digitalRead(pinVstrCntL);

  if (waitVstrCntR.justFinished()) {
    if ((vstrCntRState != lastVstrCntRState) && (vstrCntRState == LOW)) {
      if (isVstrCntLTrigered) {
        isVstrCntRTrigered = false;
        isVstrCntLTrigered = false;
        Serial.print("2;");                          //Send decrement count signal_
        Serial.println("-1");                        //_to ASPG Software
      }else if (isVstrCntRTrigered){
        barrierBoom.write(90);
        isVstrCntRTrigered = false;
      }
      else{
        barrierBoom.write(0);
        isVstrCntRTrigered = true;
      }
    }
    lastVstrCntRState = vstrCntRState;
    waitVstrCntR.repeat();
  }

  if (waitVstrCntL.justFinished()) {
    if ((vstrCntLState != lastVstrCntLState) && (vstrCntLState == LOW)) {
      if (isVstrCntRTrigered) {
        isVstrCntRTrigered = false;
        isVstrCntLTrigered = false;
        Serial.print("2;");                          //Send increment count signal_
        Serial.println("1");                         //_to ASPG Software
      }
      else{
        isVstrCntLTrigered = true;
      }
    }
    lastVstrCntLState = vstrCntLState;
    waitVstrCntL.repeat();
  }
}

void speak(int val,bool spkTens, bool spkZero) {
  if(spkTens){
    if((val <= 9)&&(spkZero)){hcmp3.play(2,29); waitVoice.start(548);}      //Play "zero" audio
    if(val == 10){hcmp3.play(2,10);waitVoice.start(406);}                   //Play "ten" audio
    if(val == 11){hcmp3.play(2,11);waitVoice.start(558);}                   //Play "eleven" audio
    if(val == 12){hcmp3.play(2,12);waitVoice.start(404);}                   //Play "twelve" audio
    if(val == 13){hcmp3.play(2,13);waitVoice.start(630);}                   //Play "thirteen" audio
    if(val == 14){hcmp3.play(2,14);waitVoice.start(655);}                   //Play "fourteen" audio
    if(val == 15){hcmp3.play(2,15);waitVoice.start(635);}                   //Play "fifteen" audio
    if(val == 16){hcmp3.play(2,16);waitVoice.start(755);}                   //Play "sixteen" audio
    if(val == 17){hcmp3.play(2,17);waitVoice.start(795);}                   //Play "seventeen" audio
    if(val == 18){hcmp3.play(2,18);waitVoice.start(627);}                   //Play "eighteen" audio
    if(val == 19){hcmp3.play(2,19);waitVoice.start(702);}                   //Play "nineteen" audio
    if((val >= 20)&&(val <= 29)){hcmp3.play(2,20);waitVoice.start(456);}    //Play "twenty" audio
    if((val >= 30)&&(val <= 39)){hcmp3.play(2,21);waitVoice.start(451);}    //Play "thirty" audio
    if((val >= 40)&&(val <= 49)){hcmp3.play(2,22);waitVoice.start(495);}    //Play "fourty" audio
    if((val >= 50)&&(val <= 59)){hcmp3.play(2,23);waitVoice.start(493);}    //Play "fifty" audio
    if((val >= 60)&&(val <= 69)){hcmp3.play(2,24);waitVoice.start(622);}    //Play "sixty" audio
    if((val >= 70)&&(val <= 79)){hcmp3.play(2,25);waitVoice.start(629);}    //Play "seventy" audio
    if((val >= 80)&&(val <= 89)){hcmp3.play(2,26);waitVoice.start(434);}    //Play "eighty" audio
    if((val >= 90)&&(val <= 99)){hcmp3.play(2,27);waitVoice.start(604);}    //Play "ninety" audio
  }else{
    if(val == 1){hcmp3.play(2,1);waitVoice.start(370);}                     //Play "one" audio
    if(val == 2){hcmp3.play(2,2);waitVoice.start(377);}                     //Play "two" audio
    if(val == 3){hcmp3.play(2,3);waitVoice.start(391);}                     //Play "three" audio
    if(val == 4){hcmp3.play(2,4);waitVoice.start(364);}                     //Play "four" audio
    if(val == 5){hcmp3.play(2,5);waitVoice.start(383);}                     //Play "five" audio
```

```
    if(val == 6){hcmp3.play(2,6);waitVoice.start(508);}                    //Play "six" audio
    if(val == 7){hcmp3.play(2,7);waitVoice.start(395);}                    //Play "seven" audio
    if(val == 8){hcmp3.play(2,8);waitVoice.start(364);}                    //Play "eight" audio
    if(val == 9){hcmp3.play(2,9);waitVoice.start(345);}                    //Play "nine" audio
  }
}

void clearRowLCD(int row) {
  lcd.setCursor(0,row);
  for(int i = 0; i < 16; i++) {
        lcd.print(" ");
  }
}

void printError(){
  lcd.setCursor(0,0);
  lcd.print("Error...");                                                   //Display a text on LCD
  while (1) {
    lcd.noDisplay();                                                      // turn off the display
    delay(250);
    lcd.display();                                                        // turn on the display
    delay(500);
  }
}
```

VISUAL BASIC.NET

```
'////////////////////////////////////////////RECEIVING DATA FROM ARDUINO/////////////////////////////////////////////
Private Sub SerialPort1_DataReceived(sender As Object, e As SerialDataReceivedEventArgs) Handles
SerialPort1.DataReceived
        SerialDataValueRead = SerialPort1.ReadLine
        ReceivedSerialData(SerialDataValueRead)
End Sub

Delegate Sub SerialDataCallback(ByVal [text] As String)

Private Sub ReceivedSerialData(ByVal [text] As String)
        Dim dataString() As String = [text].Split({";"c})

        Try
            If InvokeRequired Then
                Invoke(New SerialDataCallback(AddressOf ReceivedSerialData), New Object() {[text]})
            Else
                If dataString(0) = "2" Then
                    visitorCount += Integer.Parse(dataString(1))
                    If visitorCount < 0 Then visitorCount = 0
                    If My.Settings.useVisitorCapacity Then
                        If visitorCount >= My.Settings.visitorCapacity Then
                            visitorCount = My.Settings.visitorCapacity
                            SerialPort1.WriteLine("vCountf1")
                        Else
                            SerialPort1.WriteLine("vCountf0")
                        End If
                        Label_VisitCount.Text = visitorCount & "/" & My.Settings.visitorCapacity
                    Else
                            Label_VisitCount.Text = visitorCount
                    End If
                    Label_VisitCount.Left = ((Label_VisitCount.Parent.Width / 2) - (Label_VisitCount.Width / 2)) -
(Label_VisitCount.Width / 2) + 90
                End If
                If dataString(0) = "1" Then

                    visitorTemp = Double.Parse(dataString(1))
                    RadialGauge1.ValueByTransition = Double.Parse(dataString(1)).ToString("N0")
```

```
                tempCounter = 0
                TempUpdater.Start()
            End If
            If dataString(0) = "3" Then
                If My.Settings.useFullName Then
                    TextBox_FullName.Text = dataString(3) & ", " & dataString(2)
                Else
                    TextBox_FirstName.Text = dataString(2)
                    TextBox_LastName.Text = dataString(3)
                End If
                Dropdown_Program.SelectedIndex = Integer.Parse(dataString(4))
                DomainUpDown_Year.SelectedIndex = Integer.Parse(dataString(5))
                TextBox_ContactNum.Text = dataString(6)
                TextBox_Address.Text = dataString(7)
                TextBox_Purpose.Text = dataString(8)
                If My.Settings.isAutoRecord And DeviceIsOnline Then AutoRecordCount =
My.Settings.autoRecordCount
            End If
        End If
    Catch ex As Exception
        MsgBox(ex.ToString)
    End Try
End Sub

'////////////////////////////////////////////SENDING DATA FROM ARDUINO////////////////////////////////////////////
Private Sub Buttons_Click(sender As Object, e As EventArgs) Handles Button_FeverValue.Click,
Button_TempAdjust.Click, Button_SanitizerDuration.Click, Button_minDist.Click, Button_maxDist.Click
    If sender.Equals(Button_FeverValue) Then
        Button_FeverValue.Enabled = False
        My.Settings.tempFeverVal = TextBox_FeverValue.Text
        Form_Main.SerialPort1.WriteLine("tempF" & TextBox_FeverValue.Text)
    ElseIf sender.Equals(Button_TempAdjust) Then
        Button_TempAdjust.Enabled = False
        My.Settings.tempAdjustment = TextBox_TempAdjust.Text
        Form_Main.SerialPort1.WriteLine("tempA" & TextBox_TempAdjust.Text)
    ElseIf sender.Equals(Button_SanitizerDuration) Then
        Button_SanitizerDuration.Enabled = False
        My.Settings.sanitizerDuration = TextBox_SanitizerDuration.Text
        Form_Main.SerialPort1.WriteLine("pumpD" & Integer.Parse(TextBox_SanitizerDuration.Text) * 1000)
    ElseIf sender.Equals(Button_maxDist) Then
        Button_maxDist.Enabled = False
        My.Settings.sanitizerDuration = TextBox_maxDist.Text
        Form_Main.SerialPort1.WriteLine("tempH" & TextBox_maxDist.Text)
    ElseIf sender.Equals(Button_minDist) Then
        Button_minDist.Enabled = False
        My.Settings.sanitizerDuration = TextBox_minDist.Text
        Form_Main.SerialPort1.WriteLine("tempL" & TextBox_minDist.Text)
    End If
    My.Settings.Save()
End Sub
```

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