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Cost-effective social distance maintenance in primary schools

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ABSTRACT

During the COVID-19 pandemic, technological solutions are critical keep our cities functional, and truly the long-lasting impacts of engaging technologies on urban areas may occur beyond COVID-19. This Research Topic aims to research the sustainability, tolerability and reliability of IoT solutions in response to the COVID-19 pandemic. In India, most of the educational institutions shut down at the beginning of March 2020. Children and parents had thought that schools would open up after two or three months. But after one year, the schools remain closed. Also, some schools that did open are being poorly affected by the second wave of covid spread. An automatic hand sanitizer dispensing machine is automated, non-contact hand sanitizer dispenser, which finds its use in hospitals, work places, offices, schools and far more. Sanitizer is essentially a solvent, and also a really good disinfectant in comparison to soap or solid soap, also it doesn't need water to scrub off since it is volatile and vaporizes instantly after application to hands. We are also included social distancing in our proposed system by using ultrasonic sensor which indicates the distance between the students and system so that contactless environment can be created in order to avoid spreading of Covid-19. The effectiveness of the proposed approach in terms of reliability, cost is measured and presented in this paper.

Keywords— *Automatic hand sanitizer, Embedded C, Sensor, Microcontroller, Social-distancing*

1. INTRODUCTION

As the cases of COVID-19 are spreading vastly across globe and affecting the lives of every individual mentally, physically and financially. Since the beginning of the pandemic, it is advised to follow preventive methods like regular sanitation of hands and workplace, wearing of masks and to maintain social distancing to avoid further spread of the virus. As technology is making a huge impact in every sector, it is important to bring about a technological solution to keep our lives functional, and infact the long-lasting impacts of engaging technologies on urban areas may occur beyond COVID-19. This Research Topic aims to investigate the sustainability, tolerability and reliability of IoT solutions in response to the COVID-19 pandemic.

Sanitization is an effective and preventive way to kill or stop the spread of virus. It mainly involves lowering the germ level to a safe level on objects, ambience and on individuals. Sanitization can be done in many ways including UV Sanitization, Soap Sanitization, Alcohol Sanitization, Bleach Sanitization and so on. Of the above methods, we use non-alcohol-based sanitizer which are equally as effective as other sanitization ways. Comparing with the most common method of sanitization which includes alcohol it was found to be harsh on skin especially children's and makes their hand dry since it absorbs moisture and to be flammable in nature. It is advised to use non-alcohol-based sanitizer which uses Benzalkonium Chloride which is used as an active ingredient to kill viruses, bacteria and germs. But, repeatedly touching the hand sanitizer containers to get a drop of sanitizer again initiates contact with persons, which may be risky. Hence there is need for non-contact-based hand sanitizer dispense.

Social distancing is another important preventive method to stop the spread of Covid-19. Maintaining physical distance from individuals who are a potential risk to another. We are also including a mechanism to help with social distancing in our proposed system by using ultrasonic sensor which indicates the distance between the students and system so that contactless environment can be created in order to avoid the spread of covid-19. If a student is not maintaining the social distance the system will alerts by buzzer alarm.

2. LITERATURE SURVEY

In [1] the paper mainly says about the hospital grasped infections, which is about 2 million Patients per year and also says that it is 8th leading cause for deaths annually in USA. It also says that handwashing is important and also effective with proper hand washing steps, but washing with soap and water is time consuming for peak hours in hospitals. This paper also showed the effectiveness of the alcohol-based hand sanitizers, which reduced infection rates by whopping 30%. They used hand sanitizers with 60 to 70 percent ethanol or isopropanol for reducing significant number of pathogens. The patients were also given about 4.25-ounce containers of hand sanitizer alongside their beds.

[2] Charlie Fine et. al (2006): RFID technology has generated much hype in the last few years. The major driver for its development has been the tagging of physical objects – people, places, and things – with single chip radios so they can interface with computers. RFID technology is both hailed as the key to the ―Internet of Things, ‖ and condemned as invasive surveillance technology

[3] Kamaran Ahsan et. al (2010): Industries use RFID for various applications such as personal/ vehicle access control, departmental store security, equipment tracking, baggage, fast food establishments, logistics, etc. The enhancement in RFID technology has brought advantages that are related to resource optimization, increased efficiency within business processes, and enhanced customer care, overall improvements in business operations and healthcare. Other applications include automatic toll payments, departmental access control in large buildings. personal and vehicle control in a particular area, security of items which shouldn’t leave the area, equipment tracking in engineering firms, hospital filing systems.

3. PROPOSED METHODOLOGY

Automatic sanitizer is based on Iot sensor that is IR sensor detection, once IR sensor is detected it turns on the electromechanical switching relay will turn which is connected with water pump, pump will dispense the sanitizer solution. We have also included social distancing in our proposed system by using ultrasonic sensor which indicates the distance between the student and system so that contactless environment can be created in order to avoid corona. If a person is not maintaining the social distance the system will alerts by buzzer alarm.

4. PROPOSED APPROACH

For our proposed model, we use the Arduino UNO Microcontroller and RFID technology. To program the microcontroller, Embedded C is employed.

4.1 Arduino UNO Microcontroller

Arduino is open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. It is easy to use even for beginners.

Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing).

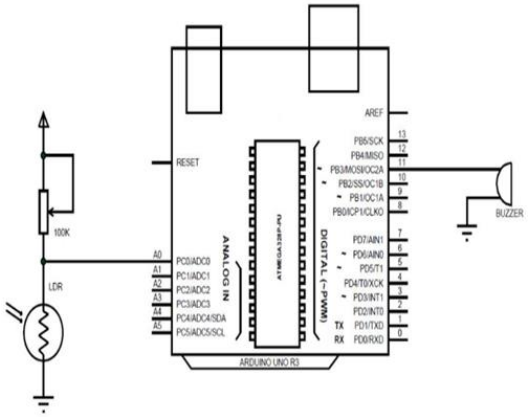

Fig 4.1.1: Architecture of Arduino UNO

As we can see from the above figure, Fig. 1, shows the architecture of the Arduino UNO. The Arduino UNO has 14 digitalinput/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

The board can operate on an external supply of 6The board can operate on an external supply of 6to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The input voltage to the Arduino board when it's using an external power source (as· opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin. 5V. The pin outputs a regulated 5V from the regulator on the board. The board can be supplied· with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision 3 of the board has the following new features: 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board.

The Arduino reference design can use an Atmega8, 168, or 328, Current models use an ATmega328. The pin configuration is identical on all three processors. Power The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a

battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

Programming The Arduino Uno can be programmed with the Arduino software (download). Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board). The ATmega328 on the Arduino Uno comes preboned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header.

4.2 RFID Technology

RFID systems can be categorized as being of a short or long read range, low or high-power consumption level, large or small hardware size, etc. The difference comes from the technical parameters of the system (e.g., the carrier frequency, type of RFID tags, etc.). Therefore, it is important to briefly discuss such parameters here so to justify the selection of an appropriate RFID solution for the system under discussion.

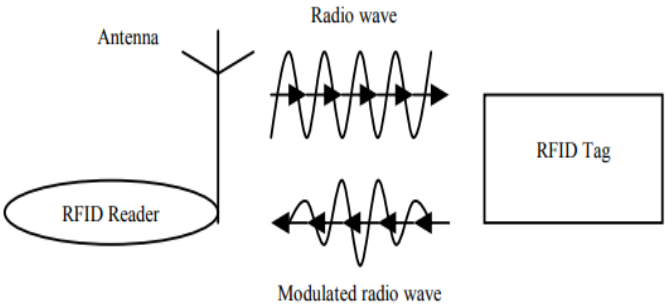

Fig 4.2.1 Working of RFID technology

As we can see from the above figure, Fig. 2, shows the architecture of the RFID system. A basic RFID system usually consists of a RFID reader and RFID tag which contain a coil that serves as antenna for transmitting and receiving signals. All kinds of RFID system operate using similar concept. RFID readers generate radio wave that reaches the RFID tags. Then, RFID tags use backscatter technology to reflect back the radio wave which has been combined with the data through modulation to the reader.

4.3 Embedded C

The embedded c programming language is used in the microcontrollers. The embedded c language is a general-purpose programming language that provides code efficiency, elements of structured programming and a rich set of operations.

Many applications can be solved more easily and efficiently with embedded c than with other more specialized languages. The embedded c language on its own is not capable of performing operations (such as input and output) that would normally require intervention from the operating system. Instead, these capabilities are provided as a part of standard library. Because these functions are separated from the language itself, embedded c is especially suited for producing code that is portable across wide platforms.

5. IMPLEMENTATION

5.1 Automatic Hand Sanitizer

An automatic hand sanitizer consists of Arduino UNO microcontroller, power supply (5V DC Adapter), IR Sensor which is connected to pin 4 of the microcontroller, 5V 1 channel relay module which is connected to pin 3 of the microcontroller, battery, water pump and a sanitizer container.

The automatic hand sanitizer is developed based on IR sensor detection, once the IR sensor detects 1second turn on the electromechanical switching relay, it will turn on the water pump which is connect to the relay and finally causes the pump to dispense the sanitizer solution. The below diagram fig.3 shows the architecture of the automatic hand sanitizer.

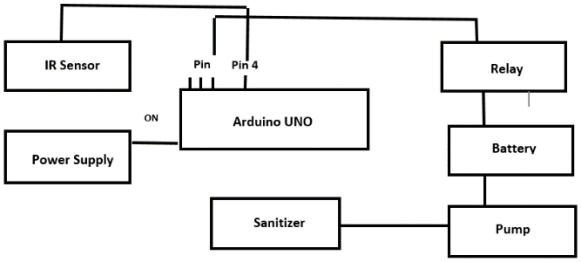

Fig 4.3.1 Architecture of Automatic Hand Sanitizer

The Sanitizers installed at class room doors would be equipped with detection sensors which would detect a student entering/exiting. On successful detection, it would generate alarm which would alert the kid to sanitize his/her hands. Once the sanitizer is used, alarm would stop.

5.2 Social Distancing using RFID technology and sensors

Low-cost social distance maintaining system leveraging the power of IoT technologies would be developed to ensure no two school kids violate the minimum distance of 2m in and around school premises. Also, the sanitization of kid's hands while entering and exiting the class room would be mandatory automated ensuring healthy social environment.

Social distance monitoring framework is based on ultrasonic sensors embedded in ID card which indicates the distance between the students. If the distance is less than 2m, then alert sound would be generated. The below diagram fig.4 shows the working of the proposed system.

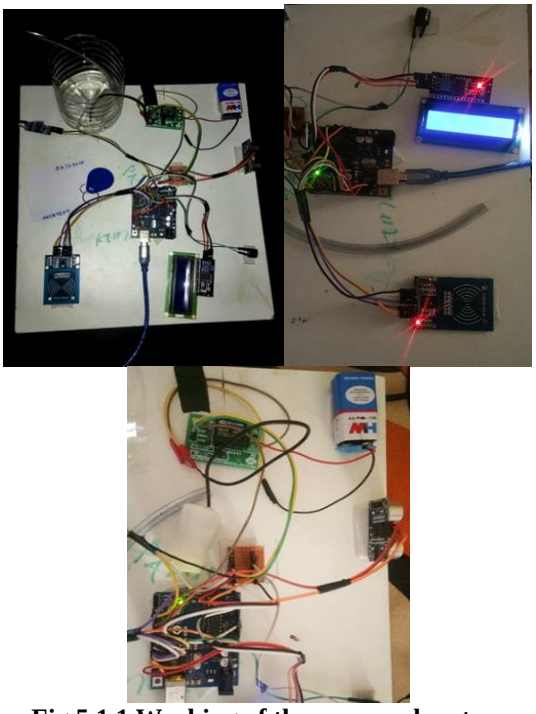

Fig 5.1.1 Working of the proposed system

The system consists of Arduino UNO microcontroller, power supply (5V DC Adapter), Ultrasonic sensor which is connected to pin 7 of the microcontroller, buzzer which is connected to pin 8 of the microcontroller, RFID tags, RFID reader which is connected to the Analog IN of the microcontroller.

The RFID tags are given a unique code which enables the RFID reader to scan the code and identify the student. The ultrasonic sensor detects any student within a distance of 2 meters and alerts the student with the help of the buzzer sound.

5.3 Code Snippet

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 16, 2);

#include <SPI.h>
#include <MFRC522.h>

#define SS_PIN 10
#define RST_PIN 9
MFRC522 mfrc522(SS_PIN, RST_PIN); // Create MFRC522 instance.

int irsensor = 4; // connect ir sensor to arduino pin 2
int pump = 3; // conect Led to arduino pin 13

const int TriggerPin1 = 7; //Trig pin
const int EchoPin1 = 6; //Echo pin
long Duration1 = 0;
int buzzer=8;
long Distance1(long time)
{
// Calculates the Distance in mm
// ((time)*(Speed of sound))/ toward and backward of object) * 10

long DistanceCalc1; // Calculation variable
DistanceCalc1 = ((time /2.9) / 2); // Actual calculation in mm
//DistanceCalc = time / 74 / 2; // Actual calculation in inches
return DistanceCalc1; // return calculated value
```

6. CONCLUSION

We come to know that hand sanitizers are more effective than soaps, and also easy to use. The paper also says that non- contact dispensing is again important to prevent pathogen spreading and finally, hand hygiene is most important and must be part of our daily life. Automatic sanitizer based on IoT sensor that is IR sensor detection, once IRsensor detected 1sec turn on the electromechanical switching relay will turn which is connected with water pump, pump will dispense the sanitor solution. We are also included social distancing in our proposed system by using ultrasonic sensor which indicates the distance between the person and system so that contactless environment can be created in order to avoid corona. If a person is not maintaining the social distance the system will alerts by buzzer alarm.

7. FUTURE SCOPE

In schools, it is difficult to monitor each and every student as they are not aware of the importance of social distancing. Thefuturescopeis to develop a system which is more user friendly not only for school children but also for employees. The developedsystemwould beabletodetectthe distance with the help of ID card and it will also have an app which will send an alert message to the higher authority if a person is not maintaining social distance.

REFERENCES

[1]. World Health Organization. (2020). Coronavirus disease (COVID-19) outbreak: rights, roles and responsibilities of health workers, including key considerations for occupational safety and health. Geneva: WHO. Retrieved 11 May 2020.

[2]. Patel A, Jernigan DB. Initial Public Health Response and Interim Clinical Guidance for the 2019 Novel Coronavirus Outbreak — United States, (December 31, 2019–February 4, 2020).

[3]. Dorman, D., 2002). Technically speaking: New vendors heating up Radio Frequency ID market," American Libraries" 33(3), 76.

[4]. ARDUINO.CC, "Arduino – Introduction", 2015 [Online] (Accessed: 25- Feb - 2015).

[5]. Arduino.cc, Arduino - Product', 2015. [Online] (Accessed: 25- Feb- 2015).

[6]. ArduPilot Mega, ArduPilot Mega, 2015. [Online].(Accessed:23- Nov- 2015).

[7]. Lescure, F.X.; Bouadma, L.; Nguyen, D.; Parisey, M.; Wicky, P.H.; Behillil, S.; Gaymard, A.; Bouscambert-Duchamp, M.; Donati, F.; Le Hingrat, Q.; et al. Clinical and virological data of the first cases of COVID-19 in Europe: A case series. Lancet Infect. (Dis. 2020, 20, 697–706).

[8]. 2. CDC (Centers for Diseases Control and Prevention). About Variants of the Virus That Causes COVID-19. Available online: https://www.cdc.gov/coronavirus/2019-ncov/transmission/variant.html (accessed on 3 April 2021).

[9]. Yamanoor, N.S.; Yamanoor, S. Low-Cost Contact Thermometry for Screening and Monitoring during the COVID-19 Pandemic. In Proceedings of the 2020 IEEE International IOT, Electronics and Mechatronics Conference (IEMTRONICS), Vancouver, BC, Canada, 9–12 September 2020; pp. 1–6.

[10]. Molnar, D. & Wagner, D. (2004). Library RFID privacy and security: Issues, practices, and architectures. 11th ACM Conference on Computer and Communications Security. ACM Press.

[11]. Radio-frequency identification. (2017, September 29). In Wikipedia, the Free Encyclopedia. Retrieved (06:00, October 5, 2017).

[12]. Syed Md. Shahid, "Use of RFID Technology in Libraries: a New Approach to Circulation, Tracking, Inventorying, and Security of Library Material , Library Philosophy and Practice Vol. 8, No. 1 (Fall 2005) ISSN 1522-0222.

[13]. Narayanan A, Sanjay Singh and Somashekaran M , Implementing RFID in Library: Methodologies, Advantages and Disadvantages. Scientific Information Resource Division, IGCAR.

[14]. Jay Singh, Navjit Brar, Carmen Fong, The State of RFID Applications in Libraries, .Information Technology and Libraries".

[15]. ICAO - COVID-19 Security and Facilitation

