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Technology solution for government schools to fight against Covid-19

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Abstract

This project deals with the purpose of giving technology solutions for government schools to Covid-19, which has severely impacted the social and economic life of people all over the world, affecting their day-to-day normal life. Especially with schools and colleges being closed, many teaching and learning processes are enabled under the online mode. So far, the students and teaching community are staying safe at home and when they start going to schools, it will be life normal for the younger generation through interaction and play among students. The student can get the Covid-19 infection during the interaction if there is no proper monitoring of their health condition daily. Continuous monitoring of health status, such as body temperature, coughing, and breathing issues of students are essential towards early diagnosis for Covid-19 symptoms and a suitable solution for the same will be useful at every school premises. Automated hand wash, social distancing, and awareness towards Covid-19 will also create an impact in the reduction of the virus spreading. Hence, in our proposal, it is planned to install a suitable technology-supported sanitizing and screening system in 3 Government schools having majority student population from under-privileged society. We can extract data(temperatures) using Bluetooth or Wi-fi, which are already stored in a thermal camera and it is checked regularly by government health officials and school management. An early screening en masse will help contain the Covid-19 community spread at schools, including automatic detection of Covid-19 symptoms in students and teachers.

Keywords: thermal imaging, sanitizing, awareness

Introduction

Covid-19 has severely impacted the social and economic life of people all over the world, affecting their day-to-day normal life. So far, the students and teaching community are staying safe at home and when they start going to schools, it will be life normal for the younger generation through interaction and play among students. It is possible for the student to get the Covid-19 infection during the interaction if there is no proper monitoring of their health condition on a daily basis.

The Government schools may not have the financial means to install some screening facilities to check students' temperature, real-time.

While cough and breathing issues can be identified easily, an early monitoring of temperature using scanners for the entire school population on a daily basis will help automate the screening through effective technology implementation. In this context, we propose to establish the Covid-19 screening facility in 3 Government schools to identify symptoms early with the help of technology, in effectively addressing the testing requirement for Covid-19 at the Schools.

Components

1. Thermal cameras
2. Ultrasonic sensor
3. IR Sensor
4. Monitor
5. Tripod
6. Public announcement system
7. Speakers
8. Automatic hand sanitizer
9. Microphone
10. Power supply

Methodology

Explanation

Thermal Cameras – Identification

With COVID-19 spreading across the planet, shutting down businesses, many hypes are being generated around installing a thermal camera for fever detection. Thermal cameras for fever detection are used almost exclusively by airports. However, they're now being installed in warehouses, meat processing plants, cruise ships, conference halls and factories. Government, healthcare, and education institutions are also using thermal cameras in places where most of the people gather. We have three major concerns when it involves employing a thermal camera for fever detection.

The suitability of thermal cameras to slowing the spread of COVID-19

1. The facility of thermal cameras to accurately detect fevers, and
2. The procedures used to implement fever detections cameras into current security systems and company practices.

The camera should not be kept near a door, window, or even a heating/cooling duct. Albeit a person stands outside for 30 seconds in colder temperatures, the reading is often off by 3-4 °C. The accuracy of Thermal Cameras are often measured by comparing the speed at which temperature reading cameras correctly identify whether a person features a fever or not. The thermal camera will take a reading and determine either that the persons skin temperature is above a gaggle threshold. The camera reading then must be

compared to an actual reading from a medical thermometer. The early identification of the Covid-19 infected students can be performed through thermal screening of the body temperature. The support staff in the school will be able to scan the body temperature of every student who enter the school. The fever symptoms including abnormal temperature can be monitored and recorded for corrective healthcare actions like doctors / parents being informed for necessary further health check-ups as required.

Thermal Imaging

- Student's health status such as Temperature of body, cough and breathing issues recorded by the thermal image cameras with Artificial intelligence and deep learning technologies.
- The accurate temperature of the body surface is measured in forehead area by thermal cameras.
- It differentiates humans from other hot objects.
- The Thermal imaging camera captures and detects fever, which can be caused by the Coronavirus COVID-19 or may be the flu.
- The body temperature scanner tracks forehead area of students and teachers and displays the measurement on a monitor.
- It can perform fever screening through a fever scanner and detect people having a far better body temperature than the specified temperature.
- It can record the temperature with just the image of the face within the system and should also detect the temperature of an individual wearing a surgical mask.



Fig 1: Thermal camera and imaging

Ultrasonic Sensor

This sensor is used for distance / space measurement using ultrasonic waves. It emits ultrasonic waves and receives the wave reflected from the object to be detected. Ultrasonic sensors measure the distance using time taken between the emission and reception. It uses only one ultrasonic element, which acts as both transmitter and receiver.

In a reflective model ultrasonic sensor, both emission and reception take place using one oscillator alternately. This allows miniaturization of the sensor head. The distance can be calculated with subsequent formula:

$$\text{Distance, } L = \frac{1}{2} * T * C$$

where T - Time between the emission and reception and C- Sonic speed. (The value is multiplied by 1/2 because T- time for go-and-return distance.) The next list shows typical characteristics enabled by the detection system. Transparent

targets can be detected because of the reflective property of waves.

Detection isn't suffering from accumulation of dust or dirt. Presence detection is stable, even for targets like mesh trays or springs. This sensor is used in automatic hand sanitizing dispensers in our project. When the students keep their hands below the dispenser, the ultrasonic sensor detects and automatically sanitizer comes out of the dispenser.

Infrared Sensor

An Infrared sensor is a device that detects Infrared rays falling there on. IR sensors have many applications in many fields, mainly electronics. It measures heat and detects the motion. It measures only IR radiation. Also known as PIR sensors.

Principle of Working

An IR sensor acts as photo-coupler or an optocoupler, as it

has both emitter and receiver. EMITTER - IR LED and DETECTOR - IR PHOTODIODE. The value of resistance and output voltage of photodiode depend on IR light received. This is the working principle of Infrared sensors. The incident ray may be of direct or indirect. In our project, when the hands of the students are kept below the dispenser, the infrared sensor detects the hands and automatically sanitizer comes out of the dispenser.

Tripod

A tripod is a transportable three-legged stand. It is used to provide support and stability to the object kept on it. It provides stability against downward and horizontal forces and movements about horizontal axes. The three legs are positioned far away from the vertical centre. It permits the tripod better leverage for resisting lateral forces. In photography, a tripod is employed to stabilize and elevate a camera, a flash unit, or other equipment.

When the camera is mounted on the tripod, it can be rotated and tilted. Tripod legs are usually made to telescope so as to save lots of space when not in use. Tripods are usually made from aluminium, carbon, steel, wood or plastic. In our project, thermal camera is mounted on tripod for better positioning to monitor the temperature.

Automatic Hand Sanitizer – Precaution Measures



Fig 2: Automatic hand sanitizer

Automatic Hand Sanitizer is a contact-less dispenser. It contains Advanced Infrared Sensors, which avoids the necessity to touch the dispenser. It helps in maintaining good hygiene. It also prevents the spread of germs. Keep your hand below the dispenser, which is sensed by IR sensor and automatically hands get sanitized. It is essential to encourage people to use Automatic Touch-free Hand Sanitizers to prevent manual touch and maintain social distance, which will, to an excellent extent, break the COVID-19 chain. I personally believe there is a high importance of automatic hand sanitizers to enhance health and hygiene of people not only during pandemic, except for other times and seasons, too.

The precautionary measures can be done through the automated Contactless Handwash dispensing systems (Sample machines is shown in figure). This process will ensure students enter into school with automated disinfection process so as to prevent any large-scale

community spread.

Public Announcement System - Awareness

A public address or public address system may be a combination of a group of audio equipment that permits broadcasts over a delegated area. Often found in schools, hospitals and office buildings. PA systems are often used for announcements or emergency information and supply an easy-thanks to get information out quickly.

A public address system is an electronic system which includes microphones, amplifiers, speakers, etc. It increases the apparent volume of a person's voice, instrument, or other acoustic sound source or recorded sound or music. PA systems are utilized in any public venue that needs that an announcer, performer, etc. be sufficiently audible at a distance or over an outsized area.

The awareness about COVID-19 and its precautionary measures are continuously announced using PA system in three schools. It announces some of the COVID-19 captions like

- “Wear Mask Always”
- “Keep as Safe Distance”
- “Wash Hands Often”
- “Cover Your Cough”
- “Use Sanitizer Often”
- “Avoid Touching Your Eyes, Nose and Mouth”
- “Avoid Close Contact”
- “Stay Home When You Are Sick”
- “Wear N95 Masks”
- “Avoid Crowded Places”

Awareness among students about the Covid-19 pandemic is important and periodic awareness information can be announced to the students through public announcement (PA) system that can be deployed in the school premises. The PA system announcements can include Covid-19 related precautionary measures, social distancing and early symptoms students should be aware of, etc.

Microphone-MIC

A microphone is a transducer. It is also known as mic or mike. It has various applications in many fields and occasions. The sensitive transducer element of a microphone is named its element or capsule. A wireless microphone contains a radio transmitter. In our project, microphone is in-built with public address system for making announcements like COVID-19 awareness.

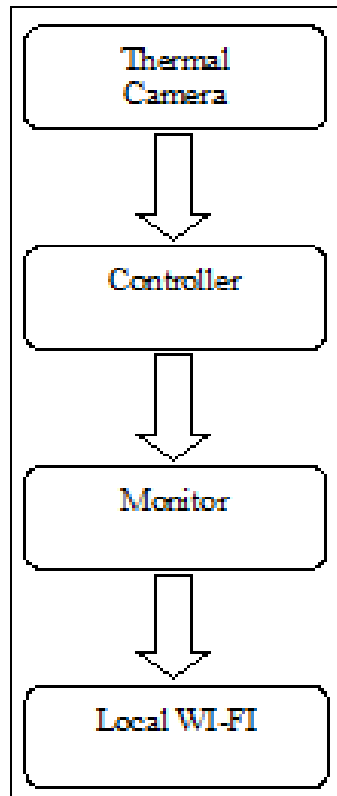
Speakers

The public announcement speakers receive their broadcast wireless from the general Public Address Transmitter. The transmitter broadcast announcements- a spread of tones or pre-recorded messages to a public address speaker or a gaggle of public address speakers. The wireless public address system allows you to put in as many speakers as you would like to make sure complete coverage of your facility. It is facilitated to audible within the school campus in our project.

Implemented Schools and Its Locations

- Lady Willington Higher Secondary School, Triplicane, Chennai.
- Government Higher Secondary School, Anagapuram, Pallavaram, Chennai.
- Tngr Higher Secondary School, Rs Puram, Coimbatore.

Block Diagram



Experimental Setup

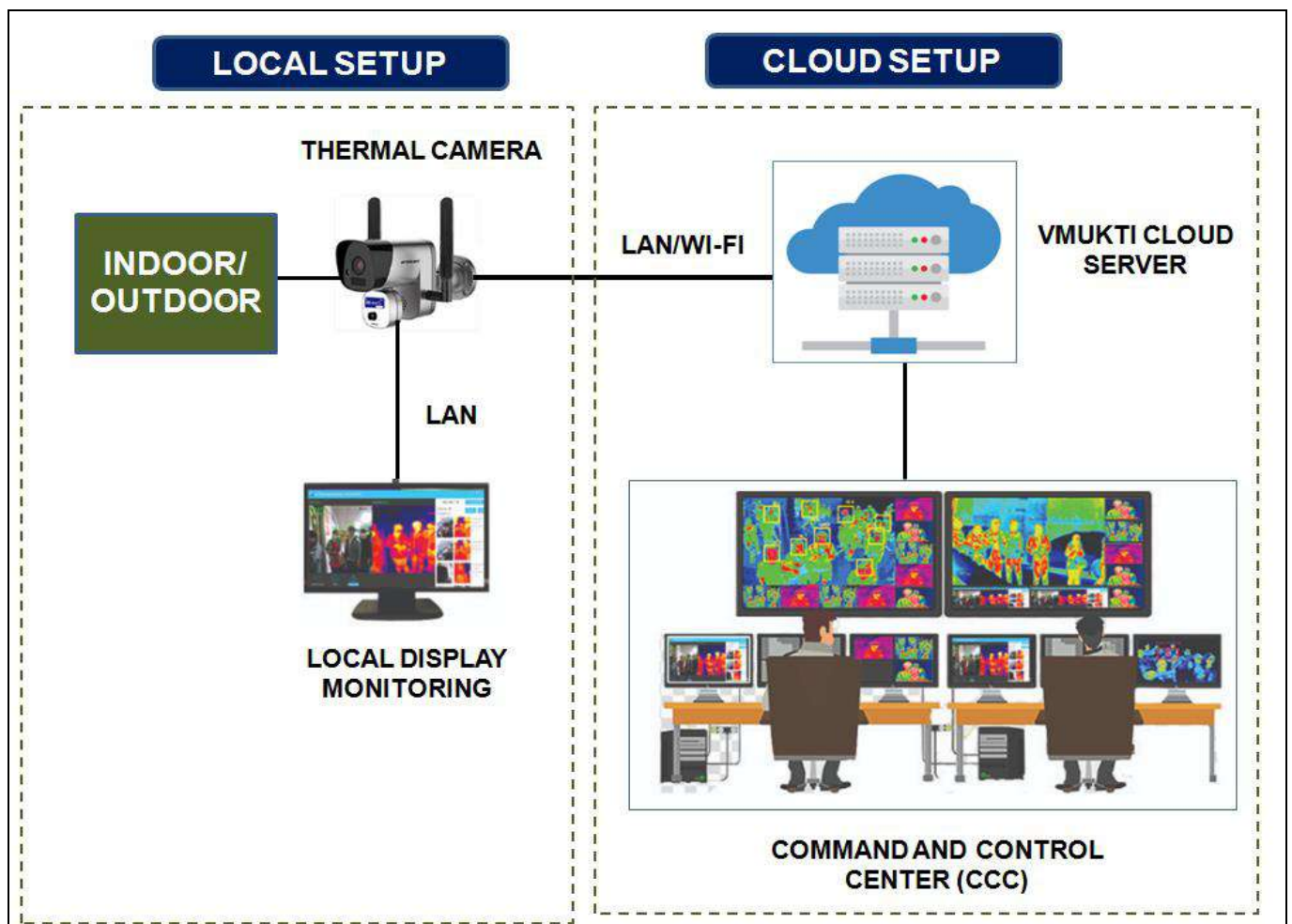


Fig 3: Experimental setup



Lady Willington higher secondary School, Triplicane, Chennai.



Government Higher Secondary School, Pallavaram, Chennai



TNGR Higher Secondary School, Rs Puram, Coimbatore

End Users



Outcomes

- Increase in awareness shall impact on reduction of virus spreading from one to one.
- Day by day continuous monitoring of health of the

school students.

- Creating a clean, healthy and disaffected environment at school, which help further not spread.
- At the medium and long-term, improvement of the socio-economic situation and education of the region during pandemic situation.
- The importance of technology for facilitating health care get acknowledged.
- Increase in the creation of videos and other resources that are relevant to the teaching communities to create such facilities at their schools/ Colleges.

Additional Benefits

- Not only Covid-19, this project is also used to predict other health illnesses like malaria, dengue, typhoid, hyperthermia and so on, to avoid the spread to other students. And we can also take early medications.
- The most important benefit of this is to detect INFLUENZA, which is widely spread during winter.
- Attendance monitoring using face recognition.

Theory Of Change-Activities

- Socialization of the project with the communities carried out by volunteers
- Construction and installation of automated sanitizer tunnels
- Installation and configuration of equipment’s used for automated sanitizer tunnels
- Hold training sessions with local and health stakeholders
- Hold training sessions with teachers
- Incubate small entrepreneurs
- Carry out a social science baseline in order to assess the impacts of the project

Vision

- Efficient Teachers and Parents communication.
- Exam marks and Syllabus display.
- Periodic updates of student performance via SMS.
- Not only students, but teachers performance can also be monitored.
- Early intimation to Parents about their Children health.

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