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PLC BASED HAND SANITIZER DISPENSER SYSTEM

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Abstract: In the very beginning of 2020, covid-19 exploded all over the world and disturbed our lifestyle. In these tragic conditions, alcohol-based hand sanitizers play an important role and become a vital fluid nowadays though they need to be used properly. Touching alcohol containers or hand sanitizers with infected hands can spread the virus to the next person. We propose to build an automatic hand sanitizer dispenser that uses IR sensors to detect the presence of a hand and activates a pump or solenoid to pour the liquid on the hand. The intention was to find the cheapest and easiest solution and design a circuit & manufacture the same in India.

The dispenser is contactless and will spray alcohol-based hand rub sanitizer for sanitization of hands while entering buildings like Hospitals, Office complexes, Malls, etc. This is a mist-based dispenser, to optimize the consumption of sanitizer. Whereas in normal usage, we use 20-30 ml of sanitizer for one operation, this sanitizer does the same job by dispensing just 5- 6ml of sanitizer in mist form over a long period.

Index Terms - LD Micro, IR-Sensor

I. INTRODUCTION

In the very beginning of 2020, a virus raised and rolled over several countries, and the earliest case related to the virus was noted in Wuhan, Hubei province.[1] WHO has given identity to this disease in the year 2019 as novel coronavirus(2019-ncov). But after some time altered its name to "Coronavirus". And Coronavirus-2 (SARS-COV-2) is the virus that has given rise to this viral disease (COVID-19). Which leads to severe acute respiratory syndrome.[2] This virus can be known as "Zoonotic". It's a scientific term for a virus that can spread and cause, effects in both animals as well as humans and it has arisen from bats.[3] Apart from this, this virus can also be transferred from one human to another.[4] Coronavirus either can be spread by the passage of air. Coming in direct contact or sometimes even indirectly. Although most commonly spread by droplets. This virus leads to contagious respiratory illness with the symptoms like mild flue and difficulty in breathing. In series cases, it can also be visible as pneumonia. This patient usually suffers from acute respiratory distress syndrome and within a short passage of time, he dies due to the failure of several organs.[5] The presence of this disease has caused a big effect on both social as well as economic aspects. WHO has already declared this a pandemic disease and several cities across the world are in completely shut down condition, to the prophet the cause of this virus, which can only be done by maintaining a proper social distance of at least one meter, by avoiding going to congested areas, avoid touching eyes, mouth, nose without cleaning hand with soap or alcohol-based hand sanitizer.[6] Several steps are taken regarding the prevention of covid-19 such as availability of containers for cleaning fluids in several public areas but these arrangements at present are unsuccessful because there are parts that often terms in contact or touch. Which could lead to the transference of covid-19. several other steps related to health are also been taken with the help of automatic systems. Which can automatically monitor the quality of air.[7] hand sanitizers [8][9], hand hygiene [10],[11]. Hand sanitizers are just substituted for washing hands in this pandemic situation. And the good thing is it can also be used when water is not available. The availability of sanitizer is in several forms like liquid, spray, gel [12]. Hand sanitizers are generally manufactured from a variety of materials such as (alcohol, polyacrylic acid glycerin) [13]-[14]. The process of killing germs initially starts with the removal of oil extracts from the skin, as that the bacteria in the body will ooze out to the surface. And with the help of soap or alcohol, bacteria will be killed after scrubbing your hand for approx. 2 minutes. Hence hand sanitizers are a piece of essential equipment against covid-19 unsightly.[15] So far, most of the available hand sanitizers do not operate automatically. This article aims to make an automatic hand sanitizer where soap and water can come out automatically.

II. RESEARCH METHODOLOGY

An automatic hand sanitizer system was designed, which will be presented in two stages describing the system design and software design. This work focused on using the elasticity of pumps and improving people’s access to devices.

2.1 SYSTEM DESIGN

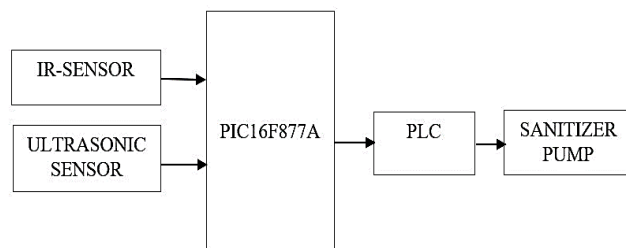


fig: - system design

Fig shown the design of the PLC Based hand sanitizer dispensing system consisting of a block and infrared sensor and an ultrasonic sensor. If the IR-sensor senses the motion of the hand, it will send data PIC16F877A microcontroller. And send data to the PLC to activate the sanitizer pump.

2.2 SOFTWARE DESIGN

The circuit scheme can be shown as PLC based hand sanitizer dispersion system.

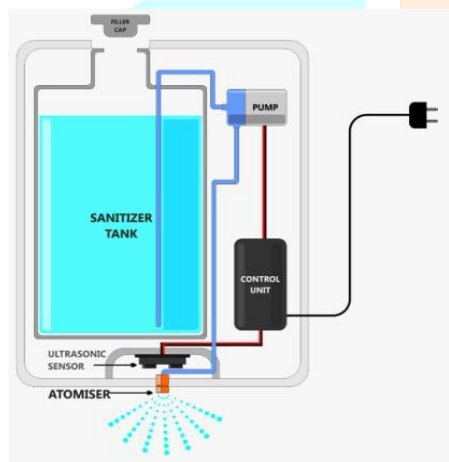


Fig 1: -Dispensation System



Fig 2. IR-Sensor

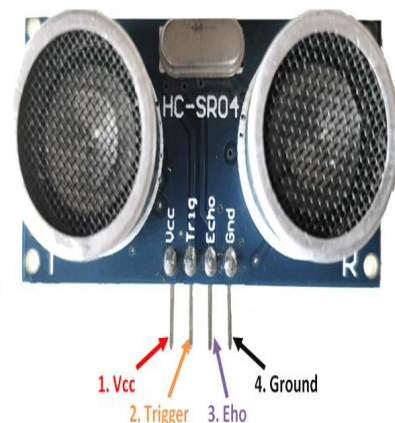


Fig 3. Ultrasonic Sensor

The circuit in this research has two systems that can work simultaneously. In Figure 3, if infrared (IR) senses heat and motion of objects, it will send data to the PLC so that it can activate the spray pump and the cleaner reaches the hand through a small pipe.

The sensor connected to the PLC will start working when the device is activated. The ultrasonic sensor in this circuit is used to detect the distance to an object. The circuit in Figure 4 works when the water level is less than 10 cm, the ultrasonic sensor will send data to the microcontroller. It sends a notification to the user that the sanitizer is empty.

III. PROCEDURE AND RESULT

3.1 PROCEDURE

In below figure, we show that a full arrangement of a PLC-based hand sanitizer dispensation system. In this arrangement according to this mainly two sensors are present the first one is XS1(Detection Sensor) and the second is XS2(Predefined sensor). In these two buttons, there are X1 is used for increasing timing for the output side & X2 is used for decreasing purpose timing for the output side. In this, mainly 5 outputs are present for 500 nano-second to 25 seconds. So, let us start with how it works. Suppose a person comes to the system so first sensor/detection sensor are detected human and on and next sensor is on when human our hand passed the nozzle side so the XS2 sensor is operating and fell down the liquid for nozzle side for X1=. So, it is only fell only 1 second and it is again operated when human our hand replaces its range XS1 and XS2 again coming range side of XS1 and XS2. So, it is operated again. This type of dispensation system’s main advantage only is decreasing the wastage of sanitizer liquid and improve the technology of the sanitizer system. The methodology behind our project is to increase efficiency by using ladder programming on PLC based system. Which helps to set the timing of come out the liquid from the machine.

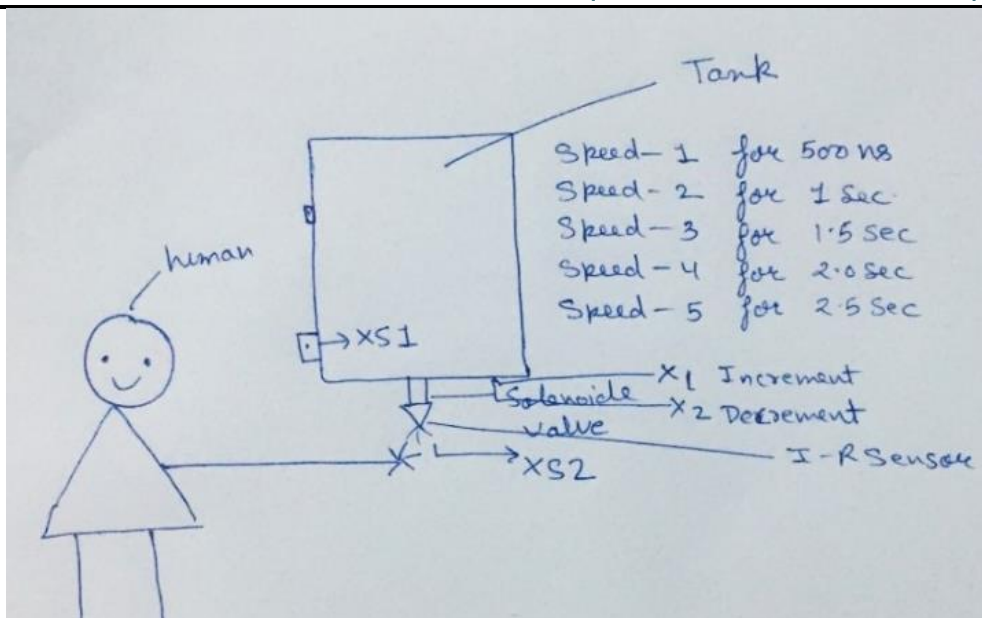
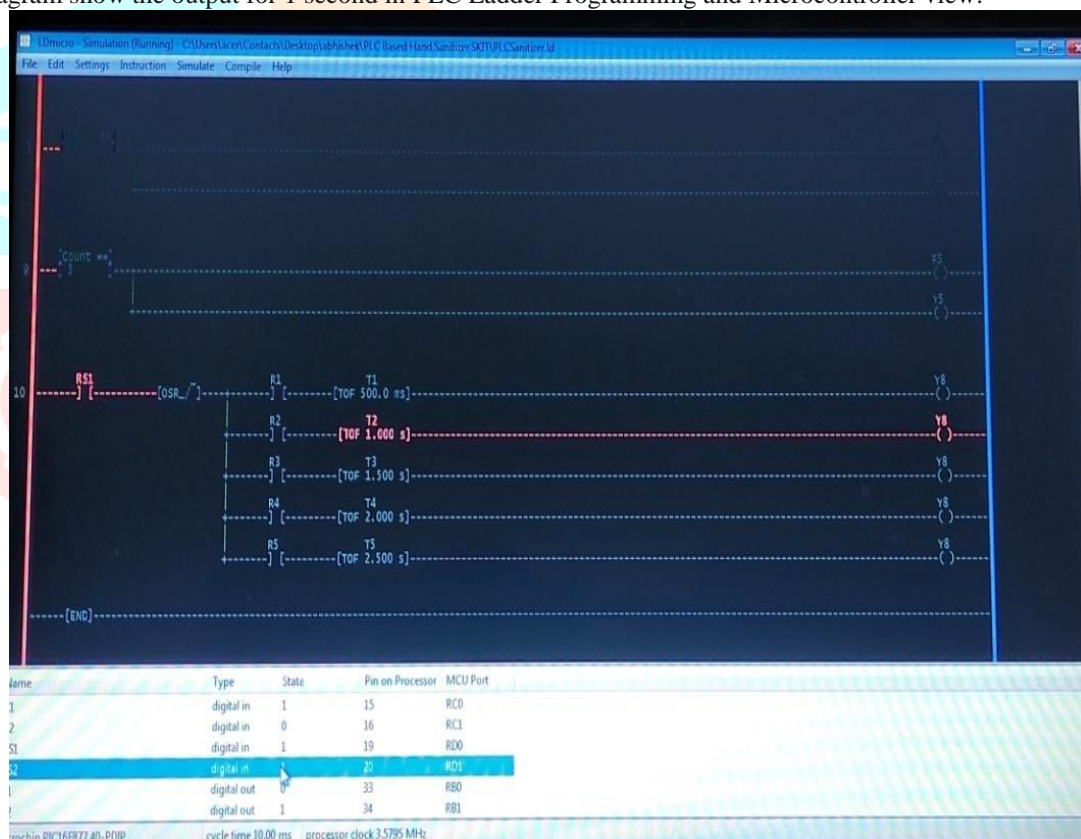


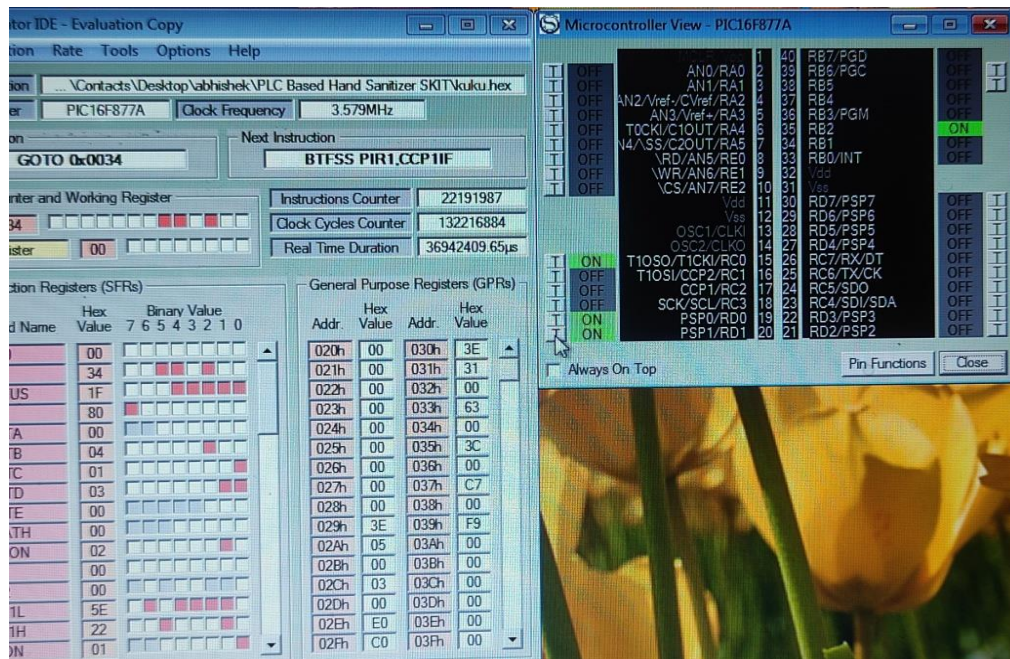
Fig 4:- procedure of Hand Sanitizer Dispensation System

3.2 RESULT & OUTPUT

The below diagram show the output for 1 second in PLC Ladder Programming and Microcontroller view.



In microcontroller view for 1 second



IV. CONCLUSION

To address this problem, we have designed an automatic hand sanitizer system that is compatible with various containers. With the proposed device, it is possible to contact many people 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 replacements.

Furthermore, it can operate compatibly with various designs of sanitizer containers, so consumers do not need to 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.

So, it can be concluded that the system can work smoothly that can prevent the spread of Covid-19.

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