IoT based Experimental Prototype of Fully Automated Smart Pan for Differently Abled Panhandlers

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Abstract

The proposed work is to cater to the basic humanitarian concerns that arise from the fact that fifty seven percent of the child beggars in India often go to sleep empty stomachs and inevitably become addicted to substance abuse. Also, there have been innumerable number of cases which are either non-traceable or non-registered which include kidnapping, assault, robbery, threat to life of beggars and specially girl child beggars and adult women who have also been victim to sexual abuse, child trafficking and many other threats.

This fully automated smart pan is specially designed for the visually impaired and disabled panhandlers. An IR sensor has been used in the work to let the beggar know whenever someone is near them. A smell detector has also been implemented in the work to let the beggar know if anyone has food to offer to them. The flap of the pan is fully automated making it easier for a specially abled beggar to access the device. The flap's rotation is controlled by the arrival of someone near the beggar or if the tub pan is filled till the brim.

An IoT module has also been implemented in this work and it plays a substantial role in providing safety and security to the beggars specially the girl child and adult women beggars. The IoT Module is used to transfer data to cloud (IP Address: 192.16.8.4.1) which can be linked to all the nearby police stations and hospitals to allow emergency help to the beggars in times of life threat.

Keywords 1

IoT Module, MQ2 Sensor, Automated flap, IR sensing, Women safety, Emergency button

1. Introduction

Begging is deep-rooted social implantation in India. It is estimated through surveys and various other means of information that approximately seventy-five percentage of the beggars are small children and ladies. This arrangement of asking and almsgiving to vagabonds and the poor is still broadly rehearsed in India, with more than 400,000 beggars which were reported in 2015[1].

Women and child safety is one of the most important and urgent needs of the hour. With the rise in the number of child beggars it has become even more dangerous to avoid the issue. There are numerous literatures that have reported work on devices fabricated for women safety. Electronic devices utilizing Raspberry Pi, a button and GPS module have been illustrated. An app has been integrated to the device module with login credentials. The application detects the location with the use of the GPS module and displays the details on the application [2].

The security of women matters a ton inside houses, outside or workplaces. There are a lot of devices and policies that have been implemented especially for women safety and security purposes. One such implementation was a footwear chip that adhered to the footwear of the individual and once

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activated, it sends the live location of the person to the police stations. A heart beat sensor was also used to record the pulse rate of the individual and if the foot was hit hard, an emergency message was sent to the police station [3].

A wearable gadget for the security and assurance of ladies has been reported. The goal is accomplished by the examination of physiological signs related to body position. The physiological signs that are examined are galvanic skin opposition and internal heat level [4].

Despite the fact that numerous innovations have been presented for ladies actually capturing, eve-prodding, and inappropriate behavior are occurring in our country. At the point when the ladies face unstable circumstances, to guarantee security, a programmed location framework needs to be set up which sends an alarm message that incorporates the area of the police division. This should be possible by detecting different factors like strange sounds, body responses like shuddering, fearing, and heartbeat which can be detected utilizing a sensor and to give the ready message. In this paper, authors studied the current instrument for distinguishing areas, sending interchanges, and gathering actual boundaries of the human body utilizing sensors [5].

A wearable gadget was developed keeping in mind the safety and security of ladies. Internet of Things (IoT) was the key implementation feature in the device. It could be worn as a ring making it easily portable for the consumer. Raspberry Pi Zero and Raspberry Pi cameras were used in the device for tracking purposes [6].

To reduce the problem of travelling faced by the visually impaired person on a daily basis, a device in the shape of eyeglasses was thought of which could guide and also protect the individual. A multi sensor fusion based algorithm was used. It avoided small obstacles. Three kinds of cues were implemented in the device for the blind people to go ahead on any of them to reach out to their destination safely. Several low-cost sensors were developed and tested for accuracy and efficiency before implementation. Hence, this device provides a smooth experience to the consumer. [7]

Ongoing advances in cell phones and moderate open-source equipment stages have empowered the improvement of ease designs for IoT empowered indoor house mechanization and security frameworks. The framework typically comprises detecting and activating layers which consist of sensors like uninvolved infrared sensors, otherwise called movement sensors, smoke sensors, temperature sensors and web cameras for security reconnaissance. These sensors, electrical apparatuses and IoT gadgets interface with the Internet through a home entryway [8].

The gadget-to-gadget correspondence worldview in 5G organizations gives a powerful framework to empower distinctive brilliant city applications like public security. In future savvy urban areas, thick sending of remote sensor organizations (WSNs) can be incorporated with 5G organizations utilizing Device to Device(D2D) correspondence. The D2D correspondence empowers direct correspondence between close-by-client gear (UEs) utilizing cell or impromptu connections, consequently improving the range use, framework throughput, and energy proficiency of the organization [9].

The security of ladies is the main concern nowadays and building a wellbeing gadget to go about as salvage and to forestall harm at the hour of danger is profoundly vital. In this paper, authors have reported a savvy gadget for ladies' security that mechanizes the crisis ready framework by utilizing a pressing factor sensor, pulse-rate sensor and a temperature sensor to recognize a potential outrage naturally utilizing exception identification [10].

The proposed system is described in Section 2, which gives a brief idea about the working procedure of the prototype. The experimental setup and hardware specifications are explained in detail in the sections 3 and 4 respectively. The results and observations are provided in Section 5. The next section consists of a conclusion.

2. Proposed System

Figure 1 is the block diagram depiction of the working procedure of the smart pan. The block diagram displays the system architecture and functioning of the proposed work. The main component being the Arduino, all other components are linked to it for efficient working of the system. The MQ2 sensor takes the smell from the environment and delivers a message signal to the arduino. The IoT module is used to show all the messages on the server using the IP address once the arduino sends the signal to it. The LCD screen displays the then current status of the pan and smell after receiving information. The servo motor rotates the flap of the pan according to the message provided by the sensors to the arduino. Electrical relay is activated once the sensor sends the signal to the arduino and the beggar can drink water at any time.

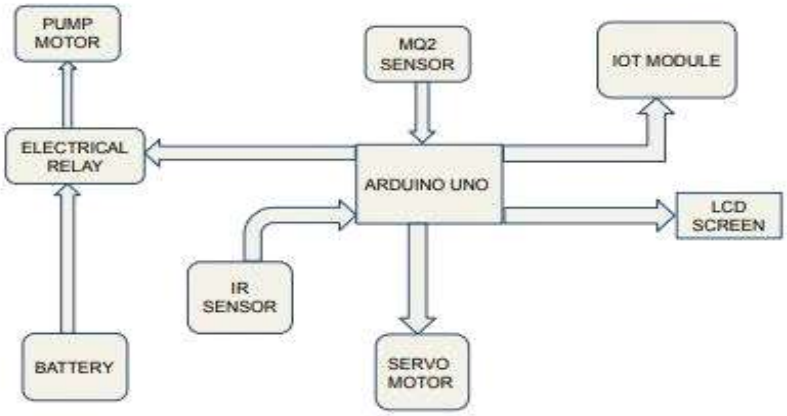

Figure 1: Block diagram of proposed system

3. Experimental Setup

Figure 2 represents the hardware model (front & top view) respectively. The figure depicts the hardware model of the proposed work from two perspectives. The front view consists of the LCD display where the current status of the pan will be displayed and also an IR sensor is mounted which will detect the presence of anyone. The top view consists of the smell detector, the arduino module and connecting wires.

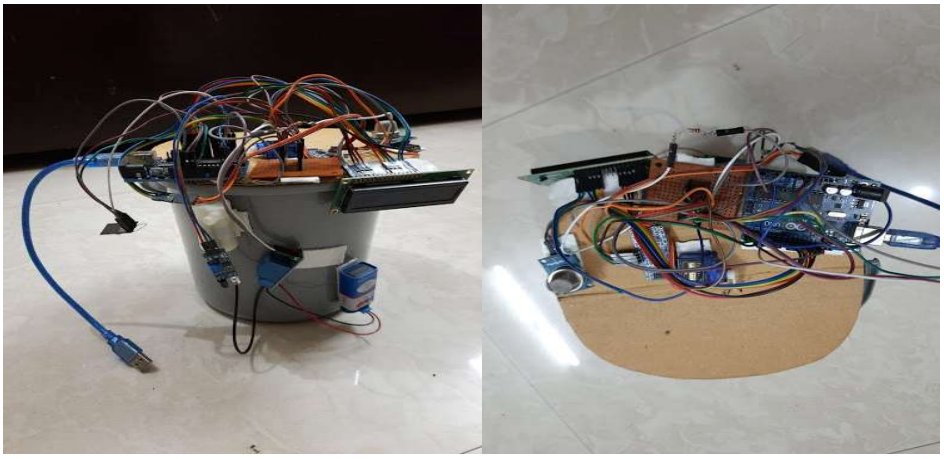

Figure 2: Prototype Setup

An IR Sensor is used to detect if someone has arrived near the beggar. An MQ2 smell/smoke sensor is used to detect if someone is providing food to the beggar. A servo motor is used at the surface of the pan to automatically operate whenever the pan is full or someone has arrived to offer money. An additional pump motor is attached to the pan to allow the beggar to drink water anywhere anytime in cases of emergency. An IoT Module is used to transfer data to cloud (IP Address) which can be used in future to link nearby police stations and hospitals to allow emergency help to the beggars. An LCD screen displays a small message whenever the pan is full or smell is detected for the deaf or disabled beggar to know automatically.

4. Hardware Specifications

- Arduino Software (1.6.7)
- Arduino UNO Atmega 328
- IR Sensor
- LCD (16X2)
- IoT Module (ESP8266)
- MQ2 Sensor
- Servo Motor (5V power supply) (0-180 degrees)
- Electrical Relay (Single pole double through switch)
- Pump Motor(12V),9V battery
- Button
- A mini bucket

5. Results and Discussion

Figure 3 depicts when the USB cable of the arduino is connected, the device starts working. When the cable is connected to a port, the device is active and starts to detect if someone is near it or not. If the IR sensor detects any presence, the flap of the pan automatically opens and the same message is also displayed on the LCD. The IR sensor senses the presence of a body and causes the motor to rotate and open the flap of the smart pan.

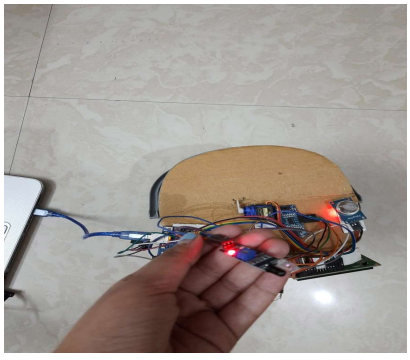

Figure 3: Working of IR Sensor when the device is connected to a power source

In Figure 4, the LCD displays the required message according to the condition:

i. pan empty/ pan full.
ii. smell detected/ no smell detected

The LCD display is connected to the Arduino. The LCD displays these messages based on the signals received from the MQ2 sensor which detects if smell is detected. This would allow the specially abled person to know the status of the pan easily.

Figure 4: LCD displays the message according to the smell detected and the pan's then status of fullness

The MQ2 sensor (figure 5) detects the smell of food and allows the pump motor to start. When someone offers food to the beggar, the smell detector detects the smell of food and rotates the motor drivers in vertical motion forcing the flaps to automatically close as no money is being offered to put inside the pan. The water motor also starts functioning so as to allow the beggar to drink water from anywhere if thirsty.

Moreover, as soon as someone arrives near the panhandler, the flap opens automatically allowing the person to dump in the money in any form, coins or currency notes. Once the person leaves and the money is dumped inside the pan, the flap automatically closes making it out from the reach of robbery.

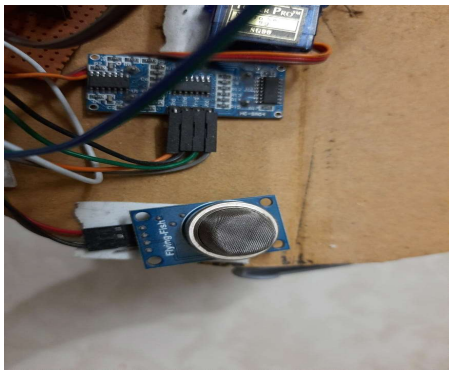

Figure 5: MQ2 smell detector that detects the smell of food if someone offers food to the beggar

The IoT module (figure 6) sends the same message to the cloud which can be viewed through the IP address 192.168.4.1. The IoT module allows the same message as displayed on the LCD screen to reach out on the above server.

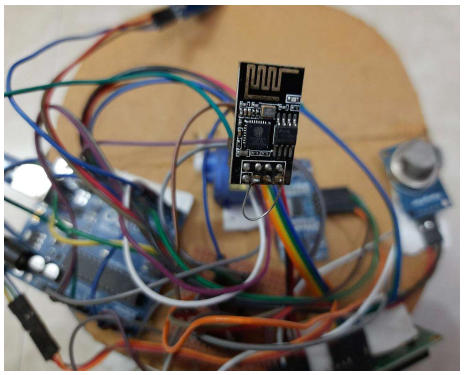

Figure 6: IoT Module used to send messages to cloud through the IP address

Figure 7 depicts the IoT module linked to an emergency button which when pressed by the beggar sends an emergency message to the cloud's IP address. It is used in this work to detect an emergency at any time of the day. The chip contains 8 pins each withstanding their own functionality. The IP address is 192.16.8.4.1.

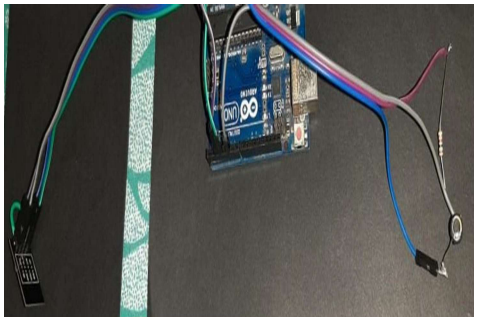

Figure 7: IoT module implemented along with an emergency button to provide emergent help to the beggar when pressed

6. Conclusion

The proposed system is implemented efficiently and is used to fulfill the requirements of the beggar in all aspects possible. The servo motor rotates the flap automatically if someone arrives near the beggar to offer money or food. The smell detector detects the smell of food if anyone offers and sends a signal to the servo motor to rotate and open the flap automatically. The water pump motor is also activated once the smell is detected to provide water to the beggar. The emergency button when pressed by the panhandler sends an emergency message to the cloud which can also be linked to the nearby police stations and hospitals to provide help in times of emergency. Overall, this work is highly beneficial to our society.

7. References

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