International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 06 | June 2020 www.irjet.net p-ISSN: 2395-0072

Automatic Ration Dispensing System using Biometric

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Abstract - *Ration Distribution System means distribution of essential commodities to a large number of people. It is done by the government. Public distribution system is one of the widely controversial, officers that involves corruption & illegal smuggling of goods. All these happen because every job in the ration shop involves manual work & there are no specific high-tech technologies to automate the job. Our main objective here is to automate the process of the distribution. The classical method involves customer to tell the person handling the ration shop outlet, the amount of the commodity he or she needs & the type too. The person working there measures the commodity & gives it to the customer. In our version of the system, we will develop an embedded system project where we will have the customer to input the amount he requires & the system made will automatically collect that much amount in a container. It is a new concept which takes into account the various social, economic & general aspects relating to technical as well as day today disciplines.*

***Key Words*: ARM LPC 2148, GSM Module, LCD Display, Relay, Fingerprint sensor, Stepper and DC Motors.**

1. INTRODUCTION

India, the foremost functional system run by the government is the Public Distribution System with a total of almost 5 Lakh government run Fair price shops (FPS). According to survey this system is solely responsible for providing food grain & oil supply to over 45 crore Indians below poverty live (BPL) at discount prices as well as remaining above poverty line (APL) people at a concise & fixed rate. The Fair Price Shops (FPS) employs more than 4.5 lakh people in Karnataka alone according to 2016 survey. Thus, the BPL population is designed to get the rationed food grains highly subsidized prices while the APL population gets the ration at open market or wholesale rates without retail. The survey also states that 57% of the PDS food grains never reach the entitled people, as in, in concise arithmetic, for every 4 rupees spent on PDS, only 1 rupee reaches the BPL & needy people. This means that the entire budget accounts for only 25 % worth of stock yearly reaching the intended target citizens. Since the statistics paint a near crisis picture of public funds going to waste, our Microcontroller commands the stepper motor to stop, at the same time with a delay the DC motor connected to the load cell with a plastic container attached rotates by a measure of 90 degree hence emptying the contents in a bowl which belong to the user.

2. BLOCK DIAGRAM

The proposed system is based on the microcontroller. The ARM LPC2148 microcontroller is the heart of system as it can be seen in the block diagram shown in figure: 1, which runs on a regulated power supply of 12 V. The GSM module, LCD and Fingerprint reader work with the embedded C programming of the microcontroller to prove an environment which is required by the proposed system. The fingerprint module scans the registered users fingerprint if present in the database, and then the GSM module sends a confirmation message to start the process of dispensing material.

The user selects the amount of food grain required by using the 4 pin keyboard & the stepper motor starts the mechanism of shutter, which releases the food grains. The load cell feedbacks to the microcontroller of the amount and when the limit is reached of the selected quantity.

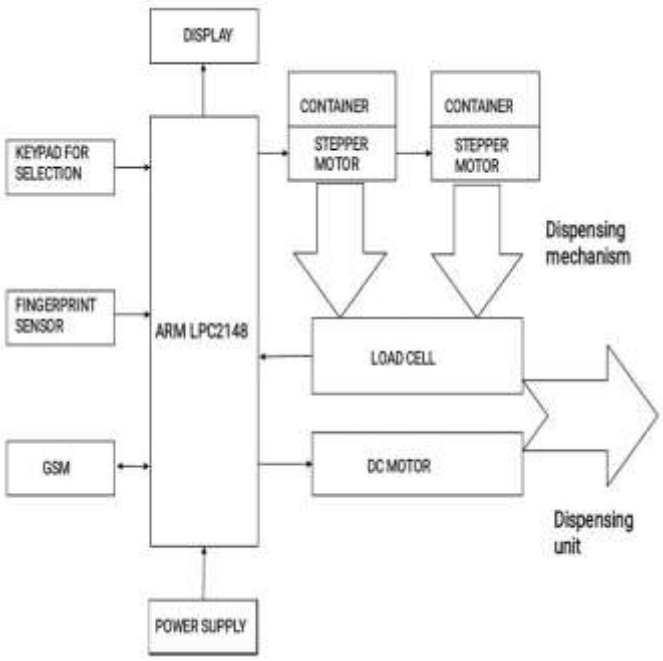

Fig-1: Block diagram of the proposed system

3. HARDWARE DESIGN

3.1 ARM LPC 2148

The ARM 7 LPC2148 Microcontroller is the heart of the system being implemented which controls all the three HMI components i.e. LCD, Keypad & Fingerprint module as well as the automated components such as motors, load cell & GSM module. Due to its low power consumption & fast processing timings it is preferably used for the proposed system. ARM generally known as Advanced RISC Machine is a reduced instruction set computer (RISC) instruction set architecture (ISA)

Fig-2: ARM LPC 2148

3.2 GSM Module

Global System for Mobile communications (GSM) is the most popular standard for mobile phones in the world. Its promoter, the GSM Association, estimate that 82% of the global mobile market uses the standard. GSM is used by over 2 billion people across more than 212 countries & territories. The whole structure of GSM network can be seen in figure 3. GSM has uses a variety of voice codec's to squeeze 3.1 kHz audio into between 5.6 and 13 Kbit/s. Originally, two codec's, named after the types of data channel they were allocated, called Half Rate (5.6 Kbit/s) and Full Rate (13 Kbit/s). These used a system based upon linear predictive coding (LPC). In addition to being efficient with bit rates, these codec's also made it easier to identify more important parts of the audio, allowing the air interface layer to prioritize and better protect these parts of the signal.

Fig-3: GSM Module

3.3 Load cell

A Load cell is a transducer that is used to create the Electrical signal whose magnitude is directly proportional to the force being measured. The schematic of the load cell is shown in figure 4. This straight bar load cell (also called a strain gauge) can translate up to 5kg of pressure (force) into an electrical signal. Each load cell is able to measure the electrical resistance that changes in response to, and proportional of, the strain (e.g. pressure or force) applied to the bar. With this gauge you will be able to tell just how heavy an object is, if an object's weight changes over time, or if you simply need to sense the presence of an object by measuring strain or load applied to a surface.

Fig -4: Load cell

3.4 (16x2) LCD Display

Liquid crystal display is a very important device in embedded system as shown in figure 5. It offers high flexibility to user as he can display the required data on it. LCD interfacing is considered a complex job but in reality, LCD interfacing is very easy task by just having logical approach.

Fig-5: LCD Display

An LCD driver is used which is a link between the microcontroller & LCD which finds out whether hardware reset is required at start-up, what is the time of reset pulse, is it active low and which pins of LCD are to be toggled. Even limited to character based modules, there is still a wide variety of shapes and Sizes available. Line lengths 8, 16,20,24,32 & 40 characters are all standard, in one, two & 4 line.

3.5 stepper and DC motors

The stepper motor is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor's position can be made to move & hold at one of these

steps without any position sensor for feedback, as long as the motor is carefully sized to the application in respect to torque and speed. In our project, we are using two stepper motors for opening/closing of valves which require a 5v DC supply for its functioning. A DC motor which is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor. In our project we have used one DC motor for the dispenser unit when the required load is met. It required a 12v DC supply for its functioning.

Fig-6: Stepper and DC motors

3.6 Relay

An electrical relay is an electromagnetically operated electrical switch an electromechanical switch. A relatively small current is used to create a magnetic field in a coil within a magnetic core and this is used to operate a switch that can control a much larger current. In this way an electromechanical relay or electrical relay can use a small current to switch a much larger current & enable both circuits to be electrically isolated from each other. When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized. In either case, applying electrical current to the contacts will change their state.

3.7 Fingerprint Sensor

Fingerprint scanners generate an image of the ridges & valleys that make up a fingerprint. But instead of sensing the print using light, the capacitors use electrical current. The sensor is connected to an integrator, an electrical circuit built around an inverting operational amplifier. The inverting amplifier is a complex semiconductor device, made up of a number of transistors, resistors & capacitors. Like any amplifier, an inverting amplifier alters one current based on fluctuations in another current. Specifically, the inverting amplifier alters a supply voltage. The alteration is based on the relative voltage of two inputs, called the inverting terminal & the non-inverting terminal. In this case, the non-inverting terminal is connected to ground, and the inverting terminal is connected to a reference voltage supply & a feedback loop. The feedback loop, which is also connected to the amplifier output, includes the two conductor plates.

Fig-7: Fingerprint sensor

4. WORKING PRINCIPLE

The user scans the finger with the fingerprint sensor & if the id is presents the program proceeds with the password matched. If the password or fingerprint is not matched then the program relays back to the initial position of scanning the fingerprint.

Then the user is asked to select the type of the material wheat or rice, which is entered through the keyboard. Further the quantity is asked 80/100/120gms.After selection of quantity the dispensing mechanism using stepper motor and delivery tunnel begins. The ration material is collected in the plastic bowl attached to the load cell & DC motor. When the load is matched, the feedback shuts down the stepper motor & DC motor rotates to the side by an angle of 90 degrees to empty the plastic bowl into the consumer utensil. A verification SMS is sent to the user with the help of GSM module attached. Giving information about the amount dispensed.

Fig-8: Results of the ration distributing system

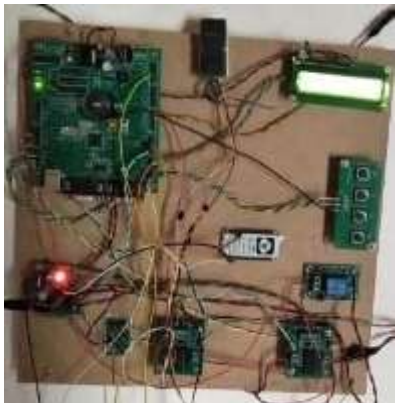

Fig-9: Proposed model of the system

5. RESULTS

As per the result, Output obtained is on the LCD display & the text message sent by the GSM module, quantifying data required is the final study of the prototype model.

The scanning of the fingerprint "PLACE YOUR FINGER" as shown in Fig 10 the scanned image is matched with stored fingerprints "SEARCHING IMAGE" and "FINDING IMAGE" as shown in Fig 11 and Fig 12 respectively.

Fig-10

Fig-11

Fig-12

The registered user enters the choice through keyboard LCD reads: "ENT_CHOICE_3: KRS 2: RICE_1: WHEAT" as shown in Figure.13 & Figure.14 the user then enters the choice of amount needed "ENT_KG:_1)80gms 2)100gms 3) 120gm" as shown in Figure.15

Fig-13

Fig-14

Fig-15

The load cell gives feedback to the processor and stepper motor stops when limit is reached as shown in Figure.16

Fig-16

6. CONCLUSION

Our proposed framework makes the ration distribution system automated & secured. Since the biometric unit is implemented, high degree of authenticity is achieved. The entire system is digitalized & made cashless. Bank accounts of every person in a family can be linked. GSM module can be avoided & the free SMS services can be used through the Wi-Fi module. Customized server and dashboard can be developed & used. Quantity of goods can be selected. Quality of goods can also be implemented.

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