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Stationery Vending Machine

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Abstract— Since their introduction, Vending machines have become an increasingly important distribution channel in public and private sectors .In Educational institutions and offices stationery vending machine is of great importance. This System proposes a microcontroller based vending machine that dispatches A4 sheets, pencil ,pen , etc., once the RFID card is read. The users can select the required item after the card is scanned and collect the item in the output unit. The system is divided into three parts, the first part deals with the scanning of RFID card which provides cashless payment. The second one is the programming unit which is implemented using µC/OSII. The third part is the display unit which displays information and delivers the required item based on the information sent from the microcontroller. An embedded system based vending machine is designed to achieve a low cost , accurate, and portable machine that can sale the stationery items automatically.

Keywords— Radio-frequency Identification(RFID),Micro C/Operating System II(µC/OSII).

I. INTRODUCTION

A Vending machine is an automatic machine that sells food such as canned soups and packaged sandwiches, snacks such as potato chips, chocolate bars, and candy); hot drinks (coffee, tea, and hot chocolate); cold drinks (juice, bottled water, soft drinks, and in some cases, milk or chocolate milk); or other items such as newspapers.The first modern coin-operated vending machines were introduced in London in the United Kingdom in the early 1880s, dispensing post cards. The machine was invented by Percival Everitt in 1883 and soon became a widespread feature at railway stations and post offices, dispensing postcards, and notepaper. The Sweetmeat Automatic Delivery Company was founded in 1887 in England as the first company to deal primarily with the installation and maintenance of vending machines. After paying, a product may become available by the machine releasing it, so that it falls in an open compartment at the bottom, or into a cup, either released first, or put in by the customer, or the unlocking of a door, drawer, or turning of a knob. Some products need to be prepared to become available. For example, tickets are printed or magnetized on the spot, and coffee is freshly concocted. One of the most common form of vending machine, the snack machine, often uses a metal coil which when ordered rotates to release the product. The main example of a vending machine giving access to all merchandise after paying for one item is a newspaper vending machine (also called vending box) found mainly in the U.S. and Canada. It contains a pile of identical newspapers. After a sale the door automatically returns to a locked position. A customer could open the box and take all of the newspapers or, for the benefit of other customers, leave all of the newspapers outside of the box, slowly return the door to an unlatched position, or block the door from fully closing, each of which are frequently discouraged, sometimes by a security clamp.

II.THEORY

A. *RFID CARD*

Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by electromagnetic induction from magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. Unlike a barcode, the tag does not necessarily need to be within line of sight of the reader, and may be embedded in the tracked object. Radio frequency identification (RFID) is one method for Automatic Identification and Data Capture (AIDC). A radio-frequency identification system uses *tags*, or *labels* attached to the objects to be identified. Two-way radio transmitter-receivers called *interrogators* or *readers* send a signal to the tag and read its response. RFID tags can be either

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passive, active or battery-assisted passive. An active tag has an on-board battery and periodically transmits its ID signal. A battery-assisted passive (BAP) has a small battery on board and is activated when in the presence of an RFID reader. A passive tag is cheaper and smaller because it has no battery. However, to start operation of passive tags, they must be illuminated with a power level roughly three magnitudes stronger than for signal transmission. That makes a difference in interference and in exposure to radiation. Tags may either be read-only, having a factory-assigned serial number that is used as a key into a database, or may be read/write, where object-specific data can be written into the tag by the system user. Field programmable tags may be write-once, read-multiple; "blank" tags may be written with an electronic product code by the user. RFID tags contain at least two parts: an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, collecting DC power from the incident reader signal, and other specialized functions; and an antenna for receiving and transmitting the signal. The tag information is stored in a non-volatile memory. The RFID tag includes either a chip-wired logic or a programmed or programmable data processor for processing the transmission and sensor data, respectively. An RFID reader transmits an encoded radio signal to interrogate the tag. The RFID tag receives the message and then responds with its identification and other information. This may be only a unique tag serial number, or may be product-related information such as a stock number, lot or batch number, production date, or other specific information.

B. *KEYPAD*

A keypad is a set of buttons arranged in a block or "pad" which usually bear digits, symbols and usually a complete set of alphabetical letters. If it mostly contains numbers then it can also be called a numeric keypad. Keypads are found on many alpha numeric keyboards and on other devices such as calculators, push-button telephones, combination locks, and digital door locks, which require mainly numeric input.

C. *LIMIT SWITCH*

In electrical engineering a limit switch (as shown in Fig.1)is a switch operated by the motion of a machine part or presence of an object. They are used for control of a machine, as safety_interlocks, or to count objects passing a point. A limit switch is an electromechanical device that consists of an actuator mechanically linked to a set of contacts. When an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection. Limit switches are used in a variety of applications and environments because of their ruggedness, ease of installation, and reliability of operation. They can determine the presence or absence, passing, positioning, and end of travel of an object. They were first used to define the limit of travel of an object; hence the name "Limit Switch".

Fig.1.LIMIT SWITCH

D. *MOTOR*

A DC motor relies on the fact that like magnet poles repel and unlike magnetic poles attract each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°. A simple *DC motor* typically has a stationary set of magnets in the stator and an armature with a series of two or more windings of wire wrapped in insulated stack slots around iron pole pieces (called stack teeth) with the ends of the wires terminating on a commutator. The armature includes the mounting bearings that keep it in the center of the motor and the power shaft of the motor and the commutator connections. The winding in the armature continues to loop all the way around the armature and uses either single or parallel conductors (wires), and can circle several times around the stack teeth. The total amount of current sent to the coil, the coil's size and what it's wrapped around dictate the strength of the electromagnetic field created. The sequence of turning a particular coil on or off dictates what direction the effective electromagnetic fields are pointed. By turning on and off coils in sequence a rotating magnetic field can be created. These rotating magnetic fields interact with the magnetic fields of the magnets (permanent or electromagnets) in the stationary part of the motor (stator) to create a force on the armature which causes it to rotate. In some DC motor designs the stator fields use electromagnets to create their magnetic fields which allow greater control over the motor. At high power levels,

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DC motors are almost always cooled using forced air. The commutator allows each armature coil to be activated in turn. The current in the coil is typically supplied via two brushes that make moving contact with the commutator. Now, some brushless DC motors have electronics that switch the DC current to each coil on and off and have no brushes to wear out or create sparks. Since the series-wound DC motor develops its highest torque at low speed, it is often used in traction applications such as electric locomotives, and trams. The DC motor was the mainstay of electric traction drives on both electric and diesel-electric locomotives, street-cars/trams and diesel electric drilling rigs for many years.

E. *LCD*

A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements. LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in most applications. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they do not suffer image burn-in. LCDs are, however, susceptible to image persistence. The LCD screen is more energy efficient and can be disposed of more safely than a CRT. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an electronically modulated optical device made up of any number of segments filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in color or monochrome.

F.*MICROCONTROLLER*

The NXP microcontroller series LPC215x uses a high performance. 32-bit ARM7 core that operates at up to 60 MHz. Each device has 512 KB of on-chip Flash and up to 40 KB of on-chip SRAM memory. A 128-bit-wide memory interface and a patented memory accelerator enable 32-bit code execution from Flash with zero wait-states. The LCD driver provides 32 segments and supports up to four backplanes. It delivers low-power operation and minimizes display overhead by using an on-chip display RAM with auto-increment addressing. It is manufactured in a silicon gate CMOS process, requires no external components, and is compatible with TTL/CMOS components and chip-on-glass technology.

III.EXISTING SYSTEM

A.*BLOCK DIAGRAM*

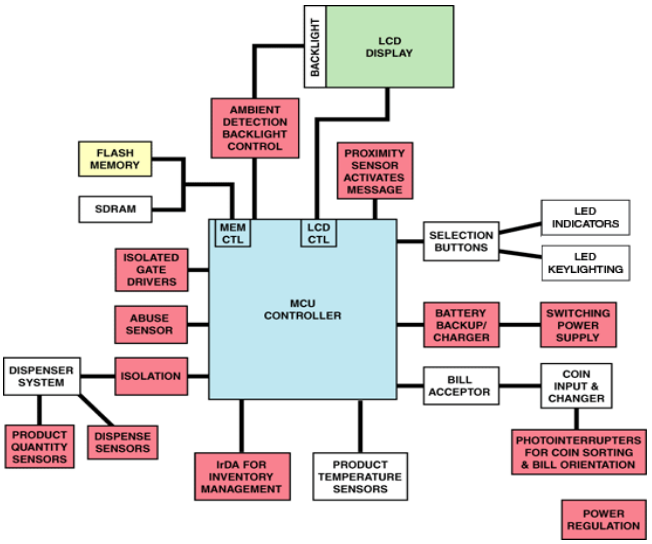

Fig.2.EXISTING SYSTEM

A coin based vending machine that delivers the items such as newspaper, Cool drink, Coffee, etc., were designed. A product as a whole is delivered.

A. *COIN UNIT*

Coin unit consist of coin box, lever, spring and coin slider. Coin slider and spring holds coin until the lever is pulled. When lever is pulled then coin falls down in a coin box. Coin unit is constructed in such a way that when coin is entered in a coin slider, it blocks the light which comes from light source and then photo diode become high resistance. When lever is pulled, light falls on photo diode which cause the resistivity of photo diode decreases to low resistance.

B. *MICROCONTROLLER*

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The digital signal and switches are interpreted by the program burn in microcontroller and is converted to the form understood by LCD. The program is written based on C-compiler

C. *LCD (LIQUID CRYSTAL DISPLAY)*

LCD consists of three control lines, resistor select (RS), read/write (R/W) and enable (E). When RS is low, LCD is in command mode otherwise in data mode. Similarly, when the R/W is high to low transition, LCD is in write mode otherwise in read mode. The control bit enable (E) is set high to display the data. Here, RS (pin4), R/W(pin5) and E(9pin6) are connected to pin number 10,11, and 12 of port 3 of the microcontroller respectively.

D. *POWER SUPPLY*

Since microcontroller (AT89S52), LCD operate on 5v dc supply, we have used 7805 regulator and 0.01 microfarad capacitor that generate constant output voltage +5 volts, output current capability of 100mA. Similarly motor driver required higher voltage, which is supplied by 12v dc supply, for the purpose we have used 7812 regulator. The regulator is supplied with 8 to 18 volts from a dc source.

IV. PROPOSED SYSTEM

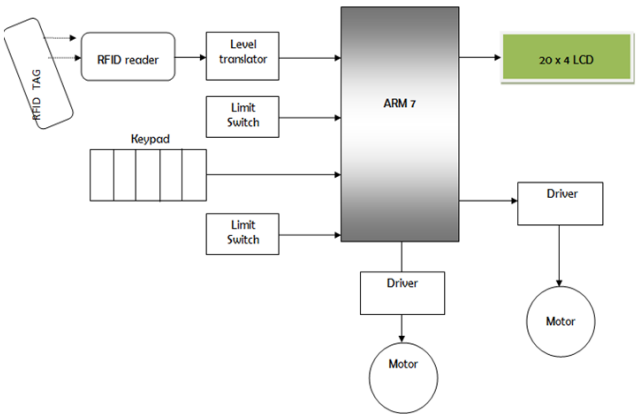
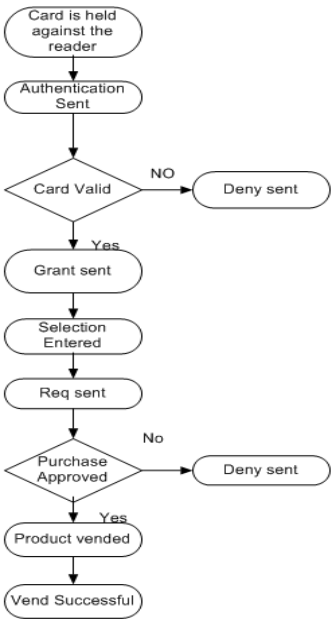


Fig.3.PROPOSED SYSTEM

- An embedded system based vending machine is designed.
- The programming module is implemented using µC/OSII.
- The RFID card is used to provide cashless payment .
- The A4 sheets are counted and delivered based on the requirement of the user.
- The other stationery items like pen, pencil are also delivered.

A. MECHANISM



IV.CONCLUSION

In the recent time use of digital is increasing day by day due to their accuracy and feasibility. Since the system operation mainly depends on high level programming, we can extend the system as our interest and requirements. This system is time saving, portable, affordable, consumes less power and can be made easily available so that the user can use this system whenever and wherever.

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