Automatic filling Machine using advance Cypress Microcontroller

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Abstract*: The project is based on Industrial application of Barrel filling or liquid filling in bottles or at petrol pumps. The empty bottle is kept on a platform scale which is a load cell and a fill command is given to the solenoid valve through controller which opens nozzle. After the required liquid is filled in the bottle a command is given by the microcontroller to open the solenoid valve which stops the flow. The project makes use of an 8 bit Programmable System On-Chip (PSOC) CY8C38 series microcontroller which is a 100 pin QFP package. It is a true PSOC Embedded with integrating configurable analog and digital peripherals, memory, and a microcontroller on a single chip. The field of automation has a notable impact in a wide range of industries beyond manufacturing. Automation plays an increasingly important role in the world economy. Filling is a task carried out by a machine that packages liquid products such as cold drinks or water. In past, humans were the main method for controlling a system. More recently electricity has been used for control and electrical control is based on microcontrollers for various purposes like medicines pharmaceutical plants, chemical plants etc. There microcontrollers control the complete working of the system. It is common to use microcontrollers to make simple logical control decision. The automation in bottle filling industry comes with increased electrical components. Essential requirements of each component in the system is important to be studied in ordered to understand how each part works in coordination with other parts in the system. This study mainly includes design, fabrication and control system for automated bottle filling system. A conveyor system with sensors and electromagnetic valve is fabricated for this purpose. The entire sequence of operation is controlled by arduino microcontroller. In small industries bottle filling operation is done manually. The manual filling process has many shortcomings like spilling of water while filling it in bottle, equal quantity of water may not be filled, delay due to natural activities of human etc. This problem faced by small industries compels to design this system. This proposed system is meant for small industries. It aims to eliminate problem faced by small scale bottle filling system. With this system which operates automatically, every process can be smooth and the process of refilling can reduce worker cost and operation cost.

1. INTRODUCTION

The Internet of Things (IoT) is a concept reflecting a connected set of anyone, anything, anytime, anyplace, any service, and any network. The IoT is a megatrend in next-generation technologies that can impact the whole business spectrum and can be thought of as the interconnection of uniquely identifiable smart objects and devices within today‘s internet infrastructure with extended benefits. Benefits typically include the advanced connectivity of these devices, systems, and services that goes beyond machine-to-machine (M2M) scenarios Therefore, introducing automation is conceivable in nearly every field. The IoT provides appropriate solutions for a wide range of applications such as smart cities, traffic congestion, waste management, structural health, security, emergency services, logistics, retails, industrial control, and health care. The world is undergoing an unprecedented technological transformation, evolving from isolated systems to ubiquitous Internet-enabled ‘things‘ capable of generating and exchanging vast amounts of valuable data. This novel paradigm, commonly referred as the Internet of Things (IoT), is a new reality that is enriching our everyday life, increasing business productivity, and improving government efficiency. In the IoT era, daily usage objects are becoming smarter, and start to play a key role in surrounding infrastructures. An important domain where IoT promises to drive significant changes and cause a huge impact is in health care systems. The use of Information and Communication Technologies in healthcare scenarios have proven several advantages of continuously monitoring health behaviours , and the IoT is enabling a more personalized, preventive and collaborative form of care, where patients are monitoring and managing their own health, and the responsibility for health care is shared between patients and the medical staff. The patient‘s data is automatically detected and wirelessly delivered to a monitoring center, through a smartphone

2. LITERATURE SURVEY

2.1Microcontroller Based Automated Water Level Sensing and Controlling: Design and Implementation Issue

In this paper we introduce the notion of water level monitoring and management within the context of electrical conductivity of the water. More specifically, we investigate the microcontroller based water level sensing and controlling in a wired and wireless environment. Water Level management approach would help in reducing the home power consumption and as well as water overflow. Furthermore, it can indicate the amount of water in the tank that can support Global Water types including cellular dataloggers, satellite data transmission systems for remote water monitoring system. Moreover, cellular phones with relative high computation power and high quality graphical user interface became available recently. From the users perspective it is required to

reuse such valuable resource in a mobile application. Finally, we proposed a web and cellular based monitoring service protocol would determine and senses water level globally.

2.2 Development of PLC based controller for bottle filling machine.

The growth in Food industry and Healthcare industry has seen a rapid increase in demands of beverages as well as medicines. Precision while filling these beverage containers is required. Non-precision will not only lead the economic loss in the beverage industry but also a danger to consumer health in healthcare industry. A typical manufacturing facility of this kind will require precision as well as velocity in filling operation, to achieve both manually is tedious task. Also to operate manually in hazardous chemical industries is safety concern to workers. To make automated bottle filling machine to achieve both accuracy and speed in filling, is requirement of the time. This can be achieved by help of PLC programming and PID controller. This paper describes the application of PLC programming and PID controller in the field of bottle filling operation. In this paper PLC is used along with various sensors as input to the system and valves are used as output to the system. This paper describes about logic developed to sense the position of bottle on the conveyor and its condition, that is whether it is filled or not. This will give accuracy of the amount to be filled and will drastically reduce the cycle time to fill one bottle ultimately resulting in any goal of any manufacturing facility that is quantity with quality.

This paper also describes about the parameters like level and flow of a liquid to be controlled. These parameters are to be controlled with the Programmable Logic Controller (PLC) and the whole process is further controlled by SCADA. PID controller is used to minimize the error. A Human Machine Interface (HMI) can be used so the user can change the set values of different parameters as required.

2.3 A Review Paper on PLC Based Automatic Fly Ash Brick Machine

Production of ash brick is an alternative utilization of fly ash. A most important part of the Fly Ash Bricks plant is Pan Mixer and molding machine. This study mainly focused on the Brick Molding Mechanism. . There are so many methods for molding of bricks, but here we have used only hydraulic compression method which is more efficient and reliable method. The pressing machine has three sets of brick moulds which are 120º apart from each other. One set of mould receive the mixture, then it is compressed and finally two bricks are made in one revolution of this machine. This paper is basically based on the saving of unnecessary economic losses and provided safety for plants workers and increases the efficiency of bricks industry. For this we have implemented this mechanism through Programming Logic Controller (PLC).

2.4 Automatic paper vending machine

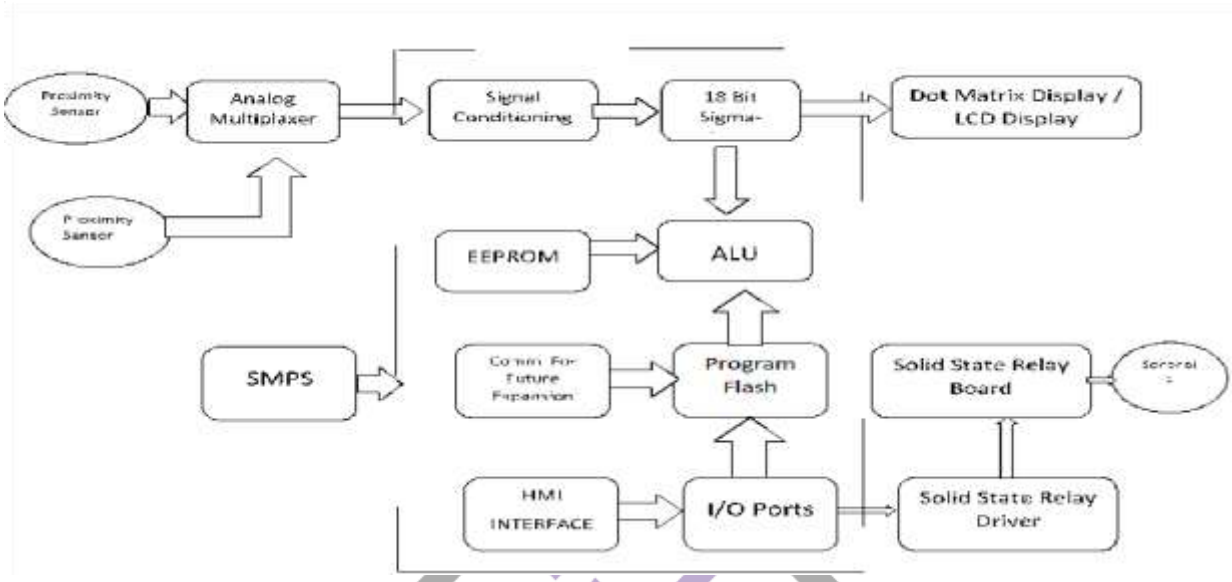
The usage of paper is inevitable and its demand is increasing steadily particularly in the places such as educational institutions, government offices, etc. At the same time, time is a precious thing that one does not want to waste in any way. In stationary shops it is quite difficult to buy papersduring rush time period and the counting of the paper depending on the requirement would cause further time delay and there is a chance for the error in the manual counting of paper. To avoid these problems, this project titled“Automatic Paper Vending Machine” is proposed to deliver the paper to the public by using the sensors and microcontrollers based on the Mechatronics principles. It will be more cheap and economic for the bulk production and it will be very useful for the college and school students. Here it is designed to deliver sheets by inputting the respective coin in the system. It will help us to save more time and manual work will be nullified.

Projected inwards past the turbine axis at a certain distance, giving a positive torque to the shaft, thus helping it to rotate in the direction it is already travelling in.[4]

As the aerofoil moves around the back of the apparatus, the angle of attack changes to the opposite sign, but the generated force is still obliquely in the direction of rotation, because the wings are symmetrical and the rigging angle is zero. The rotor spins at a rate unrelated to the wind speed, and usually many times faster. The energy arising from the torque and speed may be ex-tracted and converted into useful power by using an electrical generator.[5]

3. METHODOLOGY

3.1 Block Diagram of Automatic filling Machine



Procedure or working principle:
The project is based on Industrial application of Barrel filling or liquid filling in bottles or at petrol pumps. The empty bottle is kept on a platform scale which is a load cell and a fill command is given to the solenoid valve through controller which opens nozzle. After the required liquid is filled in the bottle a command is given by the microcontroller to open the solenoid valve which stops the flow. The project makes use of an 8 bit Programmable System On-Chip (PSOC) CY8C38 series microcontroller which is a 100 pin QFP package. It is a true PSOC Embedded with integrating configurable analog and digital peripherals, memory, and a microcontroller on a single chip.

PSoC® 3 is a true programmable embedded system-on-chip, integrating configurable analog and digital peripherals, memory, and a microcontroller on a single chip. The PSoC 3 architecture boosts performance through:

- 8051 core plus DMA controller and digital filter processor, at up to 67 MHz
- Ultra low power with industry's widest voltage range
- Programmable digital and analog peripherals enable custom functions
- Flexible routing of any analog or digital peripheral function to any pin

PSoC devices employ a highly configurable system-on-chip architecture for embedded control design. They integrate configurable analog and digital circuits, controlled by an on-chip microcontroller. A single PSoC device can integrate as many as 100 digital and analog peripheral functions, reducing

Algorithm for performing filling operations using PSOC

1) Power ON RESET For setting the values of Accumulator and registers to zero.
2) Fetch the parameters from EEPROM.
3) Start the Display and initialize the Keyboard Matrix.
4) Start the 18 bit Sigma Delta ADC(Analog to Digital Controller)
5) Activate the Solenoid Valve.
6) Check weight on the Display.
7) Compare the value with SETPOINT.
8) If yes goto next step.
9) Else goto step 6
10) DeActivate the Solenoid.
11) Wait for the Solenoid Activation.
12) Goto step 5
13) END the Algorithm.

Application:

1) Petrol Pump
2) Automatic Barrel Filling Machine
3) Food Processing Industries
4) Automatic bottle filling plant

Project Objectives:

1) To develop an Automatic filling machine to control the various parameters like weight, density of an object
2) To develop automatic filling system by controlling feed rate of the system

RESULT ANALYSIS

1) Measurement of Liquid

SR.NO	TYPE OF OBJECT/LIQUID	QUANTITY IN LITERS OR kG	OUTPUT OF LOAD CELL	DISPLAYED VALUE
01	Petrol	10 ml	0.02 V	10.01 ml
02	Oil	500ml	1.00 V	500.02ml
03	Liquid Ammonia	750ml	1.51 V	751.02ml

2) Measurement of Solid

SR.NO	TYPE OF OBJECT	QUANTITY IN LITERS OR kG	OUTPUT OF LOAD CELL	DISPLAYED VALUE
01	Talcum Powder	10 gm	0.02 V	10.01 gm
02	PVC Granules	500gm	1.00 V	500.02gm
03	Ferric Chloride	1000gm	2.01 V	999.92gm

Circuit Diagram Explanation

The 100 Pin Microcontroller CY8C38 performs all the controlling operation and provides the service routine depending on the Interrupt Signal. Parameters such as weight, temperature, Humidity, level, Ambient pressure are monitored continuously. The signals are multiplexed and conditioned before applying to the!*-bit Sigma-Delta ADC. The value is displayed on the LCD display. IC LM317 is used to provide Power Supply of +12V and +5V DC supply after rectification operation. The rectifier used is Center tapped Full wave rectifier consisting of Center tappled transformer, two diodes and a capacitor filter.
A constant current source is also formed through IC LM317.

MAX232 is an integrated circuit first created in 1987 by Maxim Integrated Products that converts signals from a TIA-232 (RS-232) serial port to signals suitable for use in TTL-compatible digital logic circuits. The MAX232 is a dual transmitter / dual receiver that typically is used to convert the RX, TX, CTS, RTS signals. The
Digital section of page1 we are also using RTC(Real Time Clock) IC DS1307.
A real-time clock (RTC) is a computer clock (most often in the form of an integrated circuit) that keeps track of the current time. Although the term often refers to the devices in personal computers, servers and embedded systems, RTCs are present in almost any electronic device which needs to keep accurate time.
Transistor BC548 is used to drive sugar cube relay of 12V. Output of relay is used through its contact to control various operations..
IC LM324 is a 14 pin quad OP-AMP which is used as a comparator to compare the set point and actual values.

4.3 LCD 16X2

LCD display is an inevitable part in almost all embedded projects and this article is about interfacing 16×2 LCD with PIC microcontroller.16×2 LCD module is a very common type of LCD module that is used in 8051 based embedded projects. It consists of 16 rows and 2 columns of 5×7 or 5×8 LCD dot matrices. The module were are talking about here is type number JHD162A which is a very popular one. It is available in a 16 pin package with back light, contrast adjustment function and each dot matrix has 5×8 dot resolution.LCD pins are VCC, VEE, RS, R/W, E, DB0 to DB7**.**The steps that has to be done for initializing the LCD display is given below and these steps are common for almost all applications.

- Send 38H to the 8 bit data line for initialization
- Send 0FH for making LCD ON, cursor ON and cursor blinking ON.
- Send 06H for incrementing cursor position.
- Send 01H for clearing the display and return the cursor.Sending data to the LCD.

The steps for sending data to the LCD module are given below. I have already said that the LCD module has pins namely RS, R/W and E. It is the logic state of these pins that make the module to determine whether a given data input is a command or data to be displayed.

4.4 RELAY BOARD

These are optically isolated relay modules having 5 Volt cube Relays. The relays are driven by aOpto-coupler which provides isolation between your Micro-controller, Arduino or Raspberry Pi & the relay thus making this module better that the modules having transistor or ULN2003 IC as drivers.

This is a 4 channel Relay Module with output relay contacts of 10 ampere at 250 volts. You can use it easily with any Micro-controller, Arduino or Single Board Computers (SBC) like Raspberry Pi and Beagle bone. You can even use this module with digital IC's like LM555 of HT12D.

Features of 4 channel 5 volt Relay Board

- Size: 75mm (length) x 55mm (W) x 19.3mm (height);
- Weight: 60g;
- PCB Color: Blue;
- board four weeks with four screw holes, hole diameter 3.1mm, easy to install and fixed;

- Relay selection of quality loose music relays, SPDT. A common terminal, a normally open, one normally closed terminal;
- optocoupler isolation, good anti-jamming;
- Low pull, high release.Energisation status indicator light, release status LED is off;
- VCC for the system power, JD_VCC for the relay power. Default hair 5V relay, plug the jumper cap to;
- Relay Maximum output: DC 30V/10A, AC 250V/10A
- Wiring: VCC: positive power supply system GND: System power supply negative IN1 – IN4: relay control ports

CONCLUSION

The world is embracing an unprecedented technological trend for connecting billions of devices. The Internet of Things is a new paradigm that is enriching our everyday life, and promises to drive significant changes and cause a huge impact in modern healthcare, by enabling a more personalized, preventive and collaborative form of care.
The developed web application collects all the data retrieved and sensed by the sensors to the server, and is also able to remotely alert the caretaker or medical staffs in the case of emergency events. The stored data can later be used for analysis, which may help medical staff to trace the evolution of their patients. The adopted IoT architecture enables the WE-Care system to co-exist with existing technology, since it follows a standardized protocol stack.

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