CHAPTER-1

INTRODUCTION

1.1 INTRODUCTION

India holds second place in population. Public Distribution System (PDS) in India has experienced drastic transformation from the rationing scheme introduced at the time of Second World War to a significant public safety program to guarantee food security to the citizens of the country. Under PDS, Government offers vital commodities at fair and fixed prices. At the beginning Government offered a numerous item like palm oil, ghee, iodized salt etc. through PDS. However, at current scenario, government offers few cereals, kerosene oil, wheat, sugar and rice at a fair prize. Currently India has more than 5,50,000 ration stores all over the country making it the major dispersal system in the world. In India, economically challenged people receives the domestic commodities like food, oil and fuel from the Government through ration shops at subsidized prize based on the card type such as Antyodana Anna Yojana (AAY) or Below Poverty Line (BPL) or Above Poverty Line (APL). Domestic commodities will be distributed to people every month. Most of the ration shop owners indulge in fraudulent activities and prevent the goods reaching the economically challenged people. Ration shop owners will also update the transactions wrongly if it is carried over manually.

1.2 LITERATURE SURVEY

Mohit Agrawal, Manish Sharma, Bhupendra Singh and Shantanu, IEEE, ‘‘Smart Ration Card Using RFID and GSM Technique”, IEEE - 978-1- 4799-7/14

India’s Public Distribution System (PDS) comprises ration shops which are responsible for distribution of ration to many poor families. Necessary commodities such as rice, kerosene, sugar, wheat etc., are supplied to the less privileged sections as per the eligibility and at fixed rates by the Indian government. However, the existing system suffers from major drawbacks such as storage of food grains, manual and inconsistent tallying of records against stock, black marketing and housekeeping.

1.3 EXISTING SYSTEM

In the current ration distribution system managed by the Food Corporation of India (FCI), the process is mostly manual. Beneficiaries are required to visit ration shops and provide their ration cards to collect subsidized food grains. The shopkeeper manually verifies the ration card details and records the transaction, which is prone to errors, delays, and fraud.

Some shops have started using RFID cards for authentication. In this system, beneficiaries swipe their RFID cards containing their details, such as their entitlement and family data. However, the system lacks advanced security and monitoring features. If the RFID card is lost or misused, there is no secondary authentication, leading to unauthorized access.

1.4 PROPOSED SYSTEM

The proposed IoT-based rationing system for FCI incorporates RFID, LCD display, Regulated Power Supply (RPS), keyboard, and GSM to enhance security, efficiency, and transparency in ration distribution. This system eliminates the need for manual verification and minimizes errors and fraud.

The process begins with the beneficiary authenticating themselves by scanning their RFID card, which contains their unique details, such as ration entitlement and identity information. Once authenticated, the beneficiary enters the required quantity of ration using the keyboard.

CHAPTER – 2

REQUIREMENT SPECIFICATION

2.1 INTRODUCTION TO IOT

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to- computer interaction.

Internet of Things (IoT) is the networking of physical objects that contain electronics embedded within their architecture in order to communicate and sense interactions amongst each other or with respect to the external environment. In the upcoming years, IoT-based technology will offer advanced levels of services and practically change the way people lead their daily lives. Advancements in medicine, power, gene therapies, agriculture, smart cities, and smart homes are just a very few of the categorical examples where IoT is strongly established.Over 9 billion 'Things' (physical objects) are currently connected to the Internet, as of now. In the near future, this number is expected to rise to a whopping 20 billion.

Today the Internet has become ubiquitous, has touched almost every corner of theglobe, and is affecting human life in unimaginable ways. We are now entering an era of even more pervasive connectivity where a very wide variety of appliances will be connected to the web. One year after the past edition of the Cluster book 2012 it can be clearly stated that the Internet of Things (IoT) has reached many different players and gained further recognition. Out of the potential Internet of Things application areas, Smart Cities (and regions), Smart Car and mobility, Smart Home and assisted living, Smart Industries, Public safety, Energy & environmentalprotection, Agriculture and Tourism as part of a future IoT Ecosystem (Figure 3.1) have acquired high attention.

Figure 2.1 IoT Ecosystem

We use these capabilities to query the state of the object and to change its state if possible. In common parlance, the Internet of Things refers to a new kind of world where almost all the devices and appliances that we use are connected to a network.

In this scenario reliably communicating data without too many retransmissions is an important problem and thus communication technologies are integral to the study of IoT devices. We can directly modify the physical world through actuators or we may do something virtually. The process of effecting a change in the physical world is often dependent on its state at that point of time. This is called context awareness. Each action is taken keeping in consideration the context because an application can behave differently in different contexts. For example, a person may not like messages from his office to interrupt him when he is on vacation. Sensors, actuators, compute servers, and the communication network form the core infrastructure of an

IoT framework. However, there are many software aspects that need to be considered. First, we need a middleware that can be used to connect and manage all of these heterogeneous components. We need a lot of standardization to connect many different devices. The Internet of Things finds various applications in health care, fitness, education, entertainment, social life, energy conservation, environment monitoring, home automation, and transport systems.

2.2 History

The Internet of Things, or IoT, is growing by leaps and bounds, with millions of new sensors and devices going online every month. If you feel like you've been hearing a lot about it recently, that's probably because, despite a fairly long history, the Internet of Things has only just been able to truly start taking off, empowered by cheap, low-power components, widespread Internet connectivity, and a iot of interest on both the corporate and the consumer side.

- 1982 – Vending machine: The first glimpse of IoT emerged as a vending machine at Carnegie Mellon University was connected to the internet to report its inventory and status, paving the way for remote monitoring.
- 1990 – Toaster: Early IoT innovation saw a toaster connected to the internet, allowing users to control it remotely, foreshadowing the convenience of smart home devices.
- 1999 – IoT Coined (Kevin Ashton): Kevin Ashton coined the term "Internet of Things" to describe the interconnected network of devices communicating and sharing data, laying the foundation for a new era of connectivity.
- 2000 – LG Smart Fridge: The LG Smart Fridge marked a breakthrough, enabling users to check and manage refrigerator contents remotely, showcasing the potential of IoT in daily life.
- 2004 – Smart Watch: The advent of smartwatches introduced IoT to the wearable tech realm, offering fitness tracking and notifications on-the-go.
- 2007 – Smart iPhone: Apple's iPhone became a game-changer, integrating IoT capabilities with apps that connected users to a myriad of services and devices, transforming smartphones into hubs.
- 2009 – Car Testing: IoT entered the automotive industry, enhancing vehicles with sensors

for real-time diagnostics, performance monitoring, and remote testing.

- 2011 – Smart TV: The introduction of Smart TVs brought IoT to the living room, enabling internet connectivity for streaming, app usage, and interactive content.
- 2013 – Google Lens: Google Lens showcased IoT's potential in image recognition, allowing smartphones to provide information about objects in the physical world.
- 2014 – Echo: Amazon's Echo, equipped with the virtual assistant Alexa, demonstrated the power of voice-activated IoT, making smart homes more intuitive and responsive.
- 2015 – Tesla Autopilot: Tesla's Autopilot system exemplified IoT in automobiles, introducing semi-autonomous driving capabilities through interconnected sensors and software.

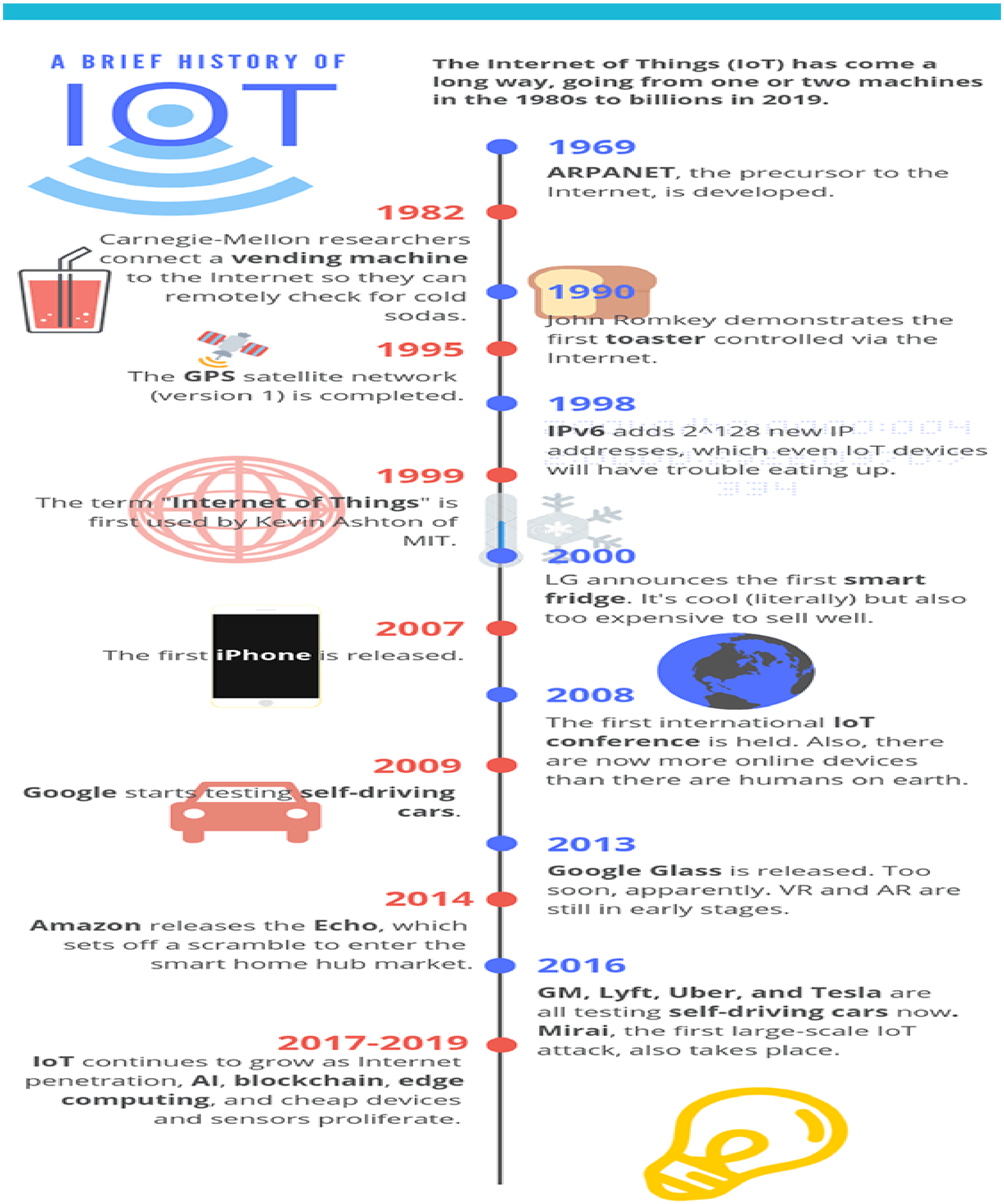


Fig:2.1.1 history of iot

Characteristics of IOT

- Massively scalable and efficient
- IP-based addressing will no longer be suitable in the upcoming future.
- An abundance of physical objects is present that do not use IP, so IoT is made possible.
- Devices typically consume less power. When not in use, they should be automatically programmed to sleep.
- A device that is connected to another device right now may not be connected in another instant of time.
- Intermittent connectivity – IoT devices aren't always connected. In order to save bandwidth and battery consumption, devices will be powered off periodically when not in use. Otherwise, connections might turn unreliable and thus prove to be inefficient.

Applications

- Smart homes/Home automation
- Healthcare
- Earthquake detection
- Radiation detection/hazardous gas detection
- Smartphone detection

CHAPTER – 3

SYSTEM DESIGN

3.1 BLOCK DIAGRAM

The Block diagram of Iot based rationing system in FCI is shown in the Figure 3.1

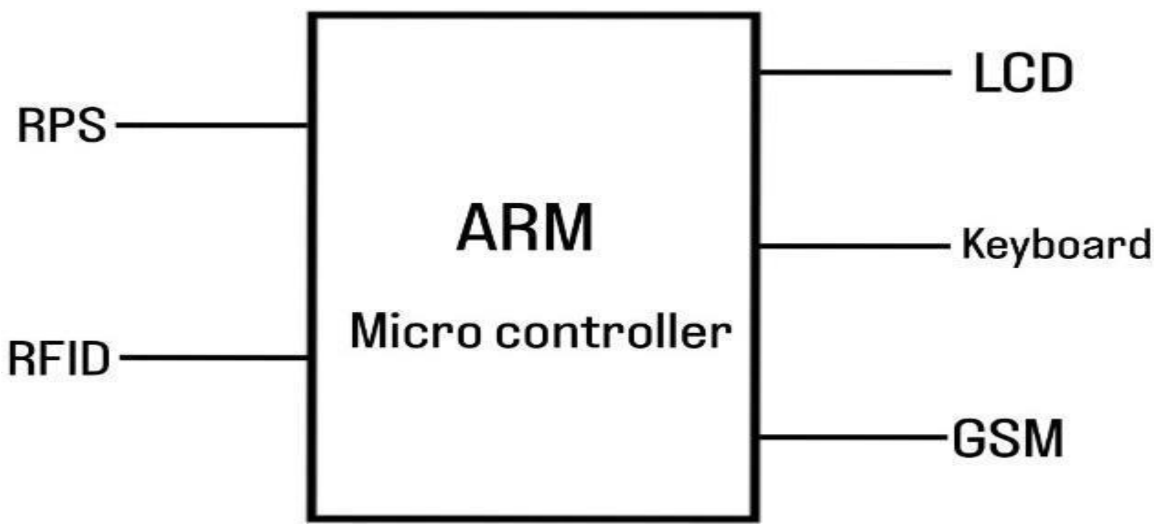


Figure 3.1 BLOCK DIAGRAM

3.2 ARDUINO UNO

The Arduino is a family of microcontroller boards to simplify electronic design, prototyping and experimenting for artists, hackers, hobbyists, but also many professionals. People use it as brains for their robots, to build new digital music instruments, or to build a system that lets your house plants tweet you when they're dry. Arduinos (we use the standard Arduino Uno) are built around an ATmega microcontroller — essentially a complete computer with CPU, RAM, Flash memory, and input/output pins, all on a single chip. Unlike, say, a Raspberry Pi, it's designed to attach all kinds of sensors, LEDs, small motors and speakers, servos, etc. directly to these pins, which can read in or output digital or analog voltages between 0 and 5 volts. The Arduino connects to your computer via USB, where you program it in a simple language (C/C++, similar to Java) from inside the free Arduino IDE by uploading your compiled code to the board. Once programmed, the Arduino can run with the USB link back to your computer, or stand-alone without it — no keyboard or screen needed, just power.

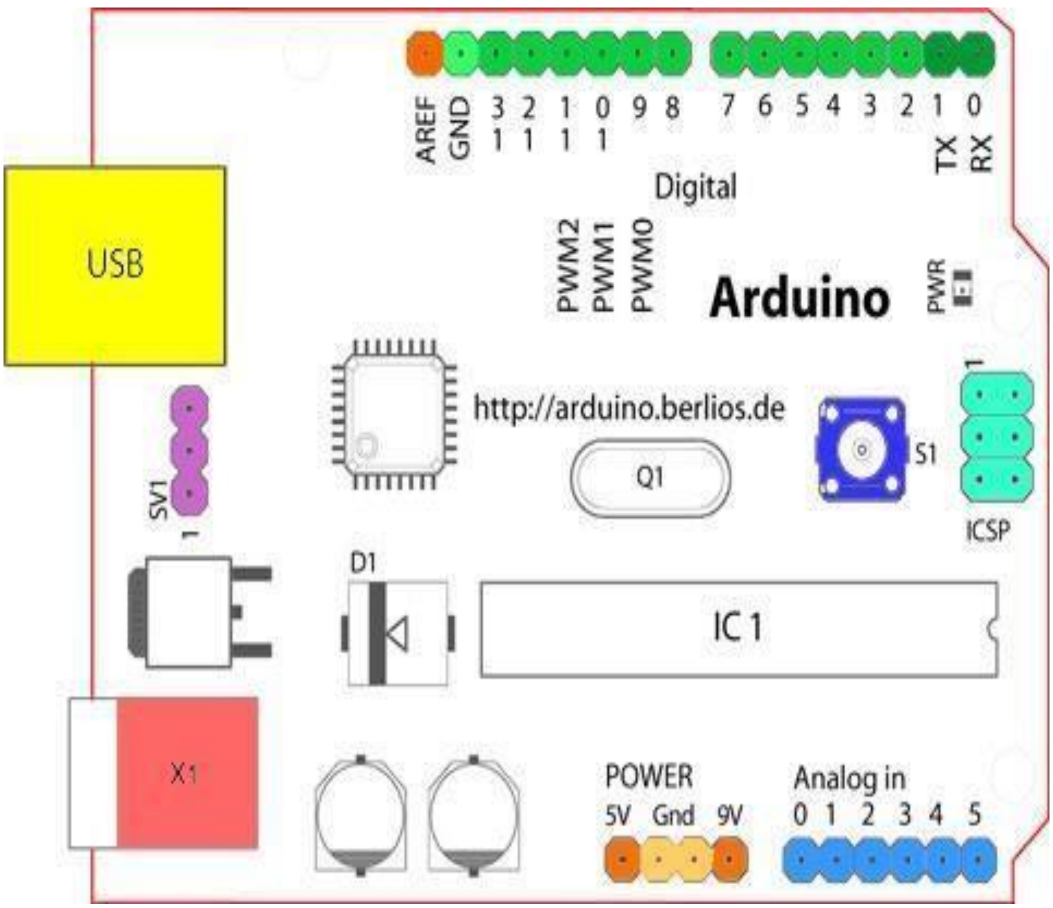


Fig:3.2 Structure of Arduino Board

ARDUINO PIN DIAGRAM

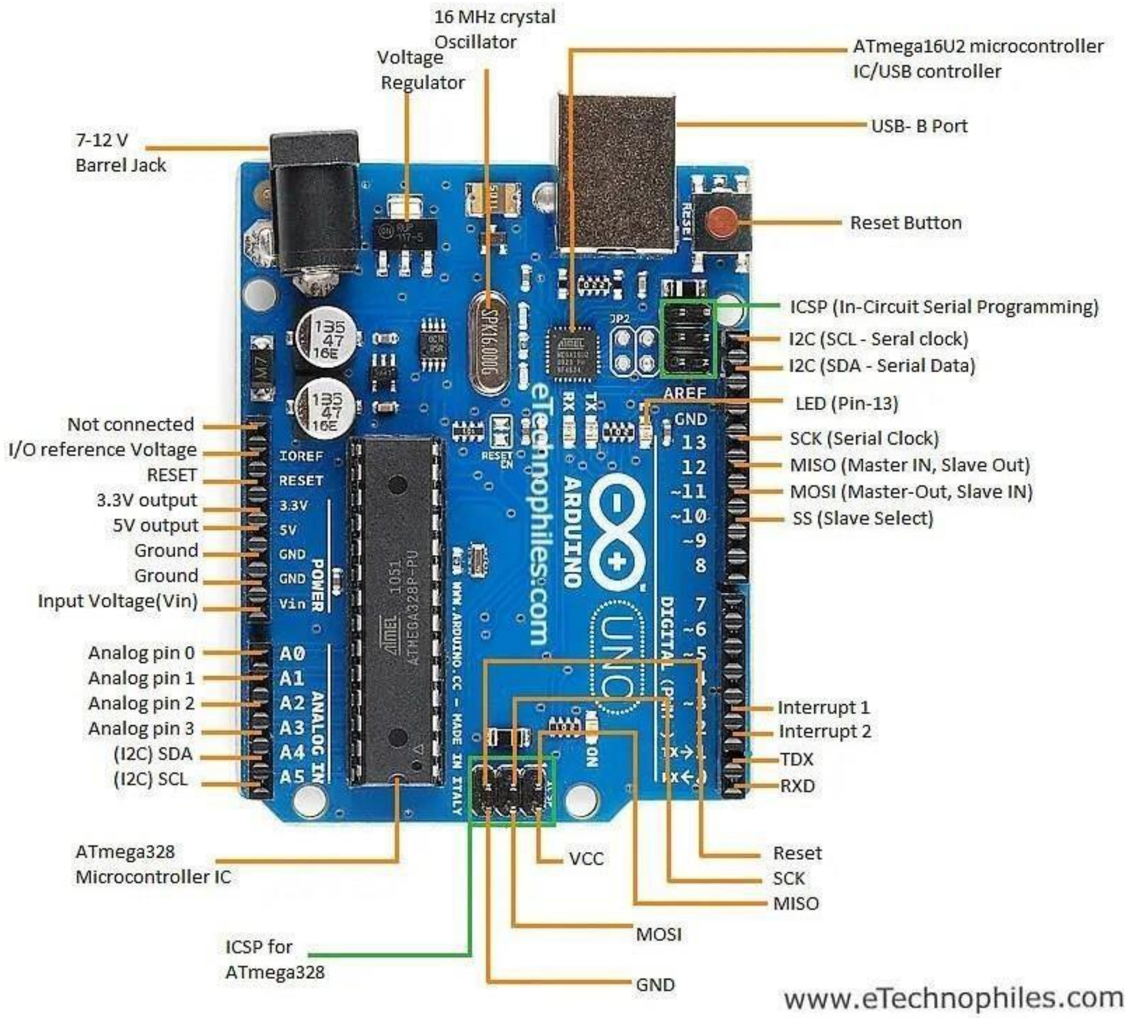


Fig:3.2.1 Arduino pin diagram

DIGITAL PINS

In addition to the specific functions listed below, the digital pins on an Arduino board can be used for general purpose input and output via the pin mode, digital read, and digital write commands. Each pin has an internal pull-up resistor which can be turned on and off using digital

Write() (w/ a value of HIGH or LOW, respectively) when the pin is configured as an input. The maximum current per pin is 40mA. **Serial: 0 (RX) and 1 (TX).** Used to receive (RX) and transmit (TX) TTL serial data. On the Arduino Diecimila, these pins are connected to the corresponding pins of the FTDI USB-to-TTL Serial chip. On the Arduino BT, they are connected to the corresponding pins of the WT11 Bluetooth module. On the Arduino Mini and LilyPad Arduino, they are intended for use with an external TTL serial module (e.g. the Mini-USB Adapter).

- **External Interrupts: 2 and 3.** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attach interrupt function for details.
- **PWM: 3, 5, 6, 9, 10, and 11** Provide 8-bit PWM output with the analog write function. On boards with an ATmega8, PWM output is available only on pins9, 10, and 11.
- **BT Reset: 7.** (Arduino BT-only) Connected to the reset line of the Bluetooth module.
- **SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK).** These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language.
- **LED: 13.** On the Diecimila and LilyPad, there is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

ANALOG PINS

In addition to the specific functions listed below, the analog input pins support 10-bit analog-to-digital conversion (ADC) using the analog read function. Most of the analog inputs can also be used as digital pins: analog input 0 as digital pin 14 through analog input 5 as digital pin 19. Analog inputs 6 and 7 (present on the Mini and BT) cannot be used as digital pins.

- **I^2C: 4 (SDA) and 5 (SCL).** Support I^2C (TWI) communication using the wire library (documentation on the Wiring website).

POWER PINS

- **VIN** (sometimes labeled "9V"): The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin. Also note that the Lily Pad has no VIN pin and accepts only a regulated input.

- **5V:** The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- **3V3** (Diecimila-only) : A 3.3 volt supply generated by the on-board FTDI chip.
- **GND:** Ground pins.

OTHER PINS

- **AREF:** Reference voltage for the analog inputs. Used with analog reference.
- **Reset:** (Diecimila-only) Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

POWER SUPPLY

The Regulated power supply (RPS) is one kind of electronic circuit, designed to provide the stable DC voltage of fixed value across load terminals irrespective of load variations. The main function of the regulated power supply is to convert an unregulated alternating current (AC) to a steady direct current (DC). The RPS is used to confirm that if the input changes then the output will be stable. This power supply is also called a linear power supply, and this will allow an AC input as wellas provides steady DC output.

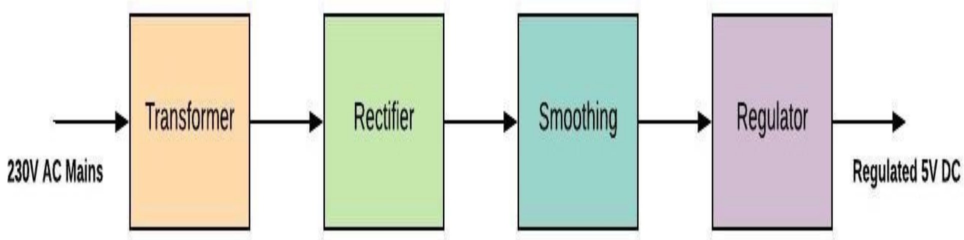


Fig:3.3 power supply

3.4 LCD (LIQUID CRYSTALDISPLAY)

LCD is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.

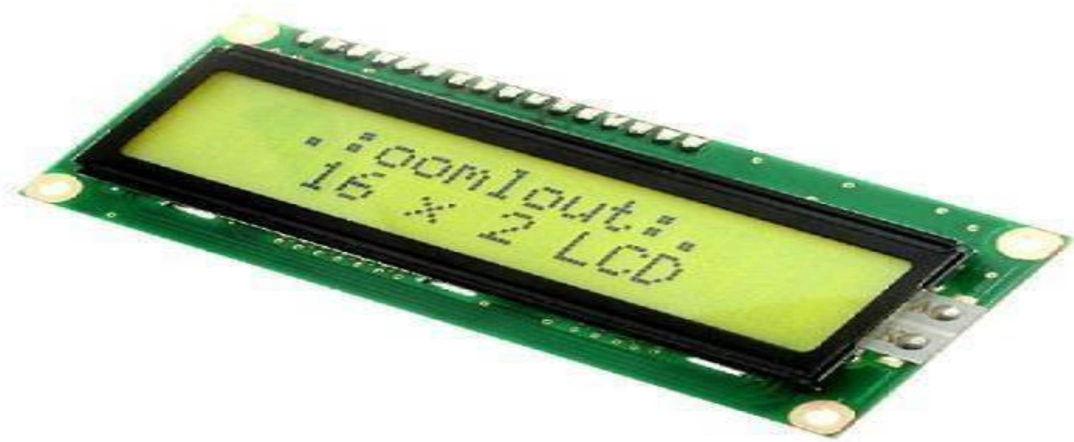


Fig:3.4 LCD display

LCD (16×2) Pin Diagram

- Pin1 (Ground/Source Pin): This is a GND pin of display, used to connect the GND terminal of the microcontroller unit or power source.
- Pin2 (VCC/Source Pin): This is the voltage supply pin of the display, used to connect the supply pin of the power source.
- Pin3 (V0/VEE/Control Pin): This pin regulates the difference of the display, used to connect a changeable POT that can supply 0 to 5V.
- Pin4 (Register Select/Control Pin): This pin toggles among command or data register, used to connect a microcontroller unit pin and obtains either 0 or 1(0 = data mode, and 1 = command mode).
- Pin5 (Read/Write/Control Pin): This pin toggles the display among the read or writes operation, and it is connected to a microcontroller unit pin to get either 0 or 1 (0 = Write Operation, and 1 = Read Operation).
- Pin 6 (Enable/Control Pin): This pin should be held high to execute Read/Write process, and it is connected to the microcontroller unit & constantly held high.
- Pins 7-14 (Data Pins): These pins are used to send data to the display. These pins are connected in two-wire modes like 4-wire mode and 8-wire mode. In 4-wire mode, only four pins are connected to the microcontroller unit like 0 to 3, whereas in 8-wire mode, 8-pins are connected to microcontroller unit like 0 to 7.
- Pin15 (+ve pin of the LED): This pin is connected to +5V
- Pin 16 (-ve pin of the LED): This pin is connected to GND.

Fig:3.4.1 LCD pin diagram

3.5 GSM

GSM module is a device that allows electronic devices to communicate with each other over the GSM network.

GSM is a standard for digital cellular communications, which means that it provides a platform for mobile devices to communicate with each other wirelessly.

This module is used for sending SMS to the user about delivered ration.Global.System for Mobile(GSM) is a second generation cellular standard developed to . cater voice services and data delivery using digital modulation.

Fig:3.5 GSM

3.6 RFID

Radio Frequency Identification (RFID) refers to a wireless system comprised of two components: tags and readers. The reader is a device that has one or more antennas that emit radio waves and receive signals back from the RFID tag.

RFID Reader is used for reading RFID tag and transmits the information to the microcontroller. Advice used to communicate with RFID Tag.

RFID tag which is used acts smart ration card and when it is swapped by customer it shows all related data. The RFID tag houses a unique identification code, typically 64 bits in length.

Fig:3.6 RFID

FIGURE 3.6.1 RFID TAG AND READER

3.7 4x4 KEYPAD

The Keypad modules are made of thin, flexible membrane material. The 4 x4 keypad module consists of 16 keys, these Keys are organized in a matrix of rows and columns. All these switches are connected to each other with a conductive trace. Normally there is no connection between rows and columns. When we will press a key, then a row and a column make contact. To detecting a pressed key, the microcontroller grounds all rows by providing 0 to the output pins, and then it reads the columns. If the data read from columns is = 1111, it means no key has been pressed.

To detecting a pressed key, the microcontroller grounds all rows by providing 0 to the output pins, and then it reads the columns. If the data read from columns is = 1111, it means no key has been pressed. When we will Pressing a button shorts one of the row lines to one of the column lines, allowing current to flow between them. For example, when key ‘Button 1’ is pressed, column 1 and row 1 are shorted. If the first column bit value is a z

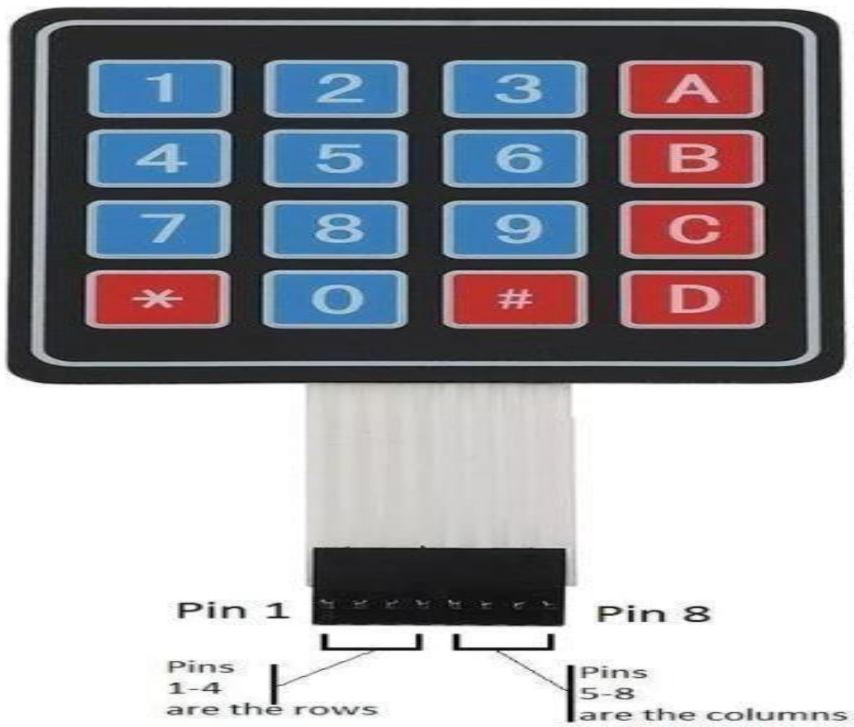


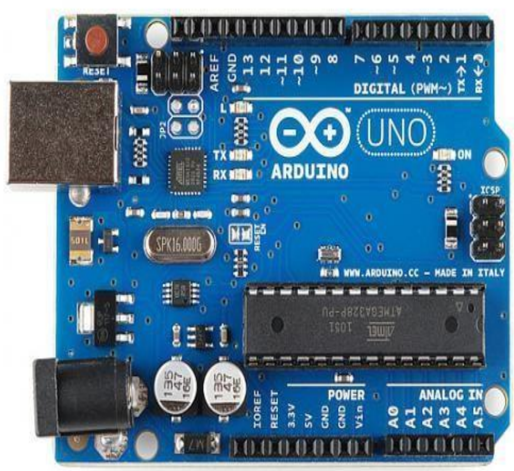
Fig:3.7 4x4 keypad

CHAPTER – 4

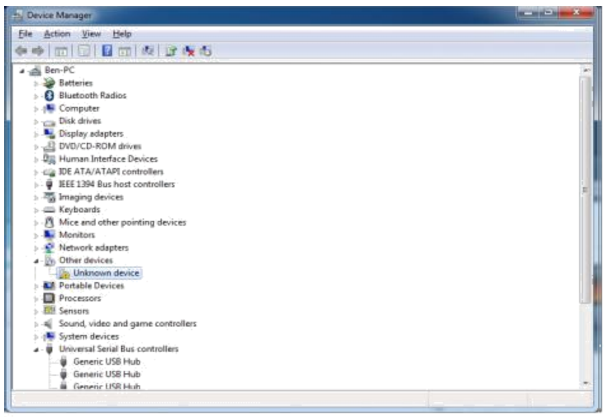
IMPLEMENTATION

4.1 WORKING

- A computer (Windows, Mac, or Linux)
- An Arduino-compatible microcontroller (anything from this guide should work)
- A USB A-to-B cable, or another appropriate way to connect your Arduino-compatible microcontroller to your computer (check out this USB buying guide if you're not sure which cable to get).



- An Arduino Uno
- Windows 7, Vista, and XP
- Installing the Drivers for the Arduino Uno (from Arduino.cc)
- Plug in your board and wait for Windows to begin it's driver installation process After a few moments, the process will fail, despite its best efforts

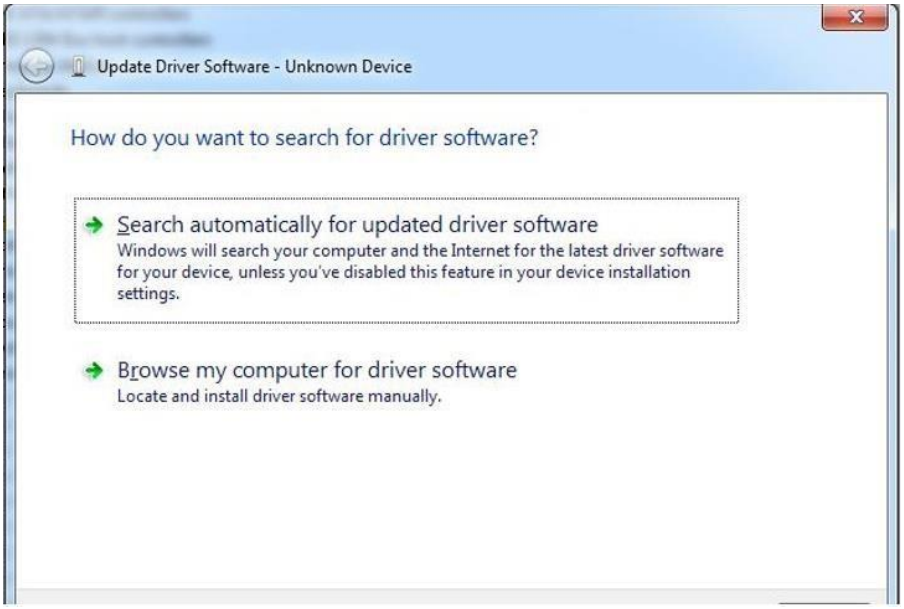


- Click on the Start Menu, and open up the Control Panel
- While in the Control Panel, navigate to System and Security. Next, click on System Once the System window is up, open the Device Manager

Look under Ports (COM & LPT). You should see an open port named "Arduino UNO

- (COMxx)".
- If there is no COM & LPT section, look under 'Other Devices' for 'Unknown Device'

- Right click on the "Arduino UNO (COMxx)" or "Unknown Device" port and choose the "Update Driver Software" option Next, choose the "Browse my computer for Driver software" option

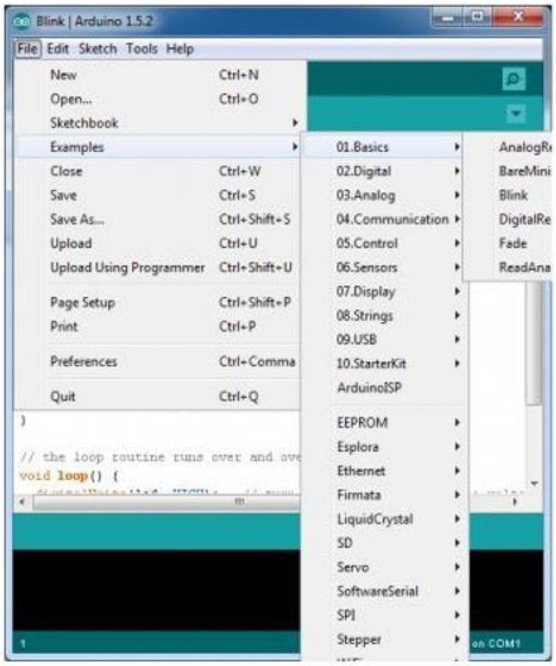


- Finally, navigate to and select the Uno's driver file, named "ArduinoUNO.inf", located in the "Drivers" folder of the Arduino Software download (not the "FTDI USB Drivers" sub-directory). If you cannot see the .inf file, it is probably just hidden. You can select the 'drivers' folder with the 'search sub-folders' option selected instead. Windows will finish up the driver installation

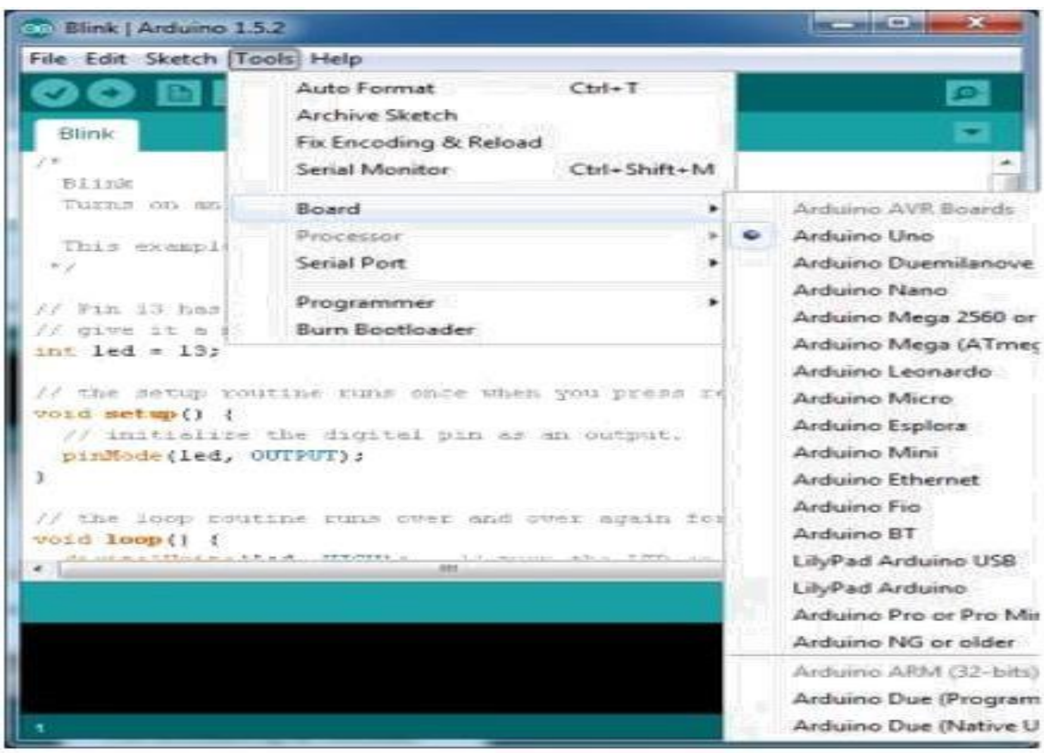
LAUNCH AND BLINK!

After following the appropriate steps for your software install, we are now ready to test your first program with your Arduino board!

- Launch the Arduino application
- If you disconnected your board, plug it back in
- Open the Blink example sketch by going to: File > Examples > 1.Basics > Blink



->Select the type of Arduino board you're using: Tools > Board > your board type



➢ Select the serial/COM port that your Arduino is attached to: Tools > Port > COMxx

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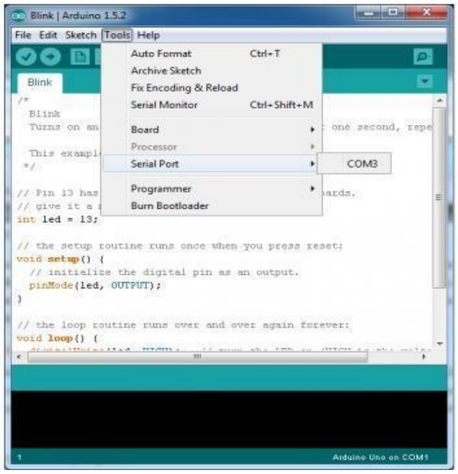

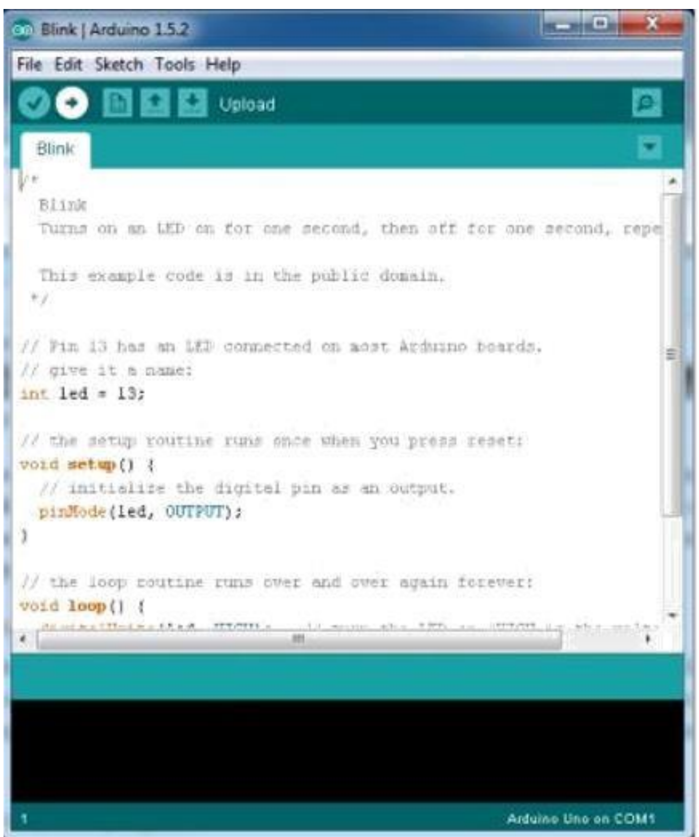

If you’re not sure which serial device is your Arduino, take a look at the available ports, then unplug your Arduino and look again. The one that disappeared is your Arduino.

With your Arduino board connected, and the Blink sketch open, press the ‘Upload’ button

After a second, you should see some LEDs flashing on your Arduino, followed by the message ‘Done Uploading’ in the status bar of the Blink sketch.

If everything worked, the onboard LED on your Arduino should now be blinking! You just Programmed your first Arduin.

CHAPTER – 5

5.1 RESULT

The implementation of a ubiquitous IoT- based rationing system for public distribution systems has been carried out effectively.

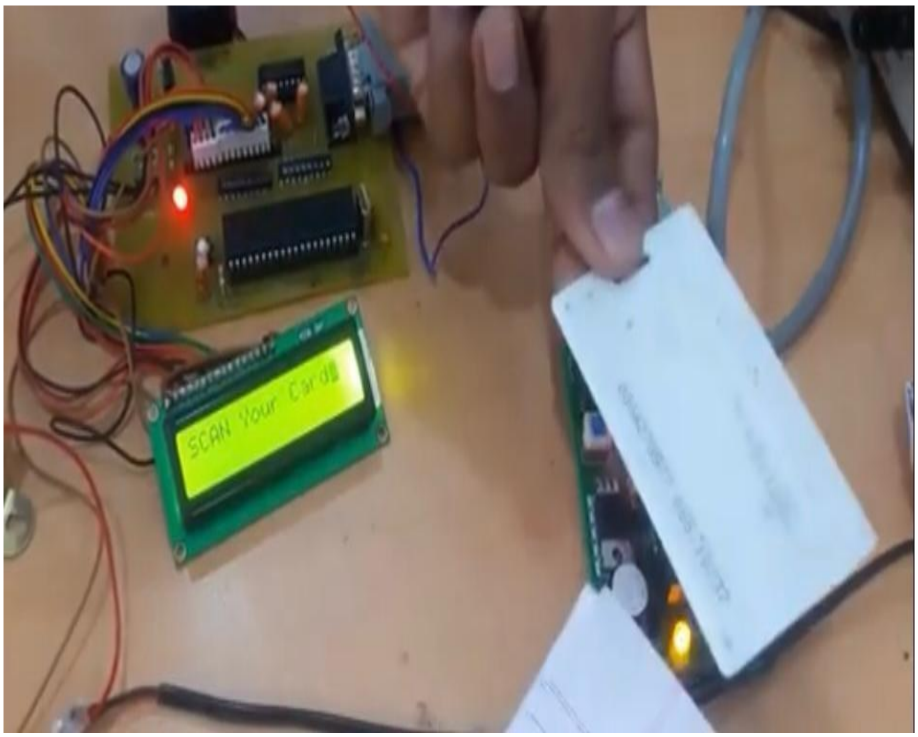

FIGURE 5.1 OUTPUT

CHAPTER - 6

6.1 CONCLUSION

IoT based Smart Ration Card system is an automated scheme, which uses fingerprint validation process. In order to provide security and accuracy to this scheme, Minutiae extraction-based algorithm is used in fingerprint validation process. This process eradicates forged ration card users and prevents them from participating in any further transgression. Picking the goods and quantity by the means of android application, the system becomes smarter and robust. By means of implementing this system, one can evade the misconducts since there is no manual process involved in it and the system also stores all details in a database.

`6.2 FUTURE SCOPE

The system can be enhanced by integrating Aadhaar-based biometric authentication and real- time inventory monitoring using loT sensors to ensure secure and efficient operations. Cloud- based analytics can be utilized to optimize resource allocation and predict demand, improving inventory management. A mobile application for beneficiaries can allow real-time access to entitlements, transaction history, and stock availability. Additionally, advanced features like blockchain for tamper-proof transactions and Al-based fraud detection can further improve transparency and reduce misuse. Scaling the system nationwide with solar- powered devices will ensure accessibility in remote areas, modernizing the Public Distribution System (PDS).

CHAPTER – 7

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