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ELECTRICAL SMART BIKE

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***Abstract*—**Fuel is one of the most valuable commodities worldwide, and this has led to a manifold increase in fuel theft globally. Most of the fuel is stolen while in transport between industries. Detecting this theft becomes difficult due to the multiple logistic complexities involved. A secure system that prevents the fuel from being stolen from the tanker is proposed. The system involves continuously monitoring the fuel level in the storage tank of the tanker. When the fuel drops below a specified limit, an alert will be sent to the driver and the fuel agency. A keypad security system based on dual password authentication acts as the first layer of security. A GPS module enables authorities to monitor the location of the truck through a mobile application. The novelty of the proposed system is enabled security system which will ensure the communication between the sender and receiver parties and after confirmation, fuel would be dispensed. This system will help play an important role in the prevention of fuel theft.

***Keywords*—**Fuel, Kepad security system, Dual Password authentication.

I. INTRODUCTION

Fuel is one of the most valuable commodities worldwide, and this has led to a manifold increase in fuel theft globally. Most of the fuel is stolen while in transport between industries. Detecting this theft becomes difficult due to the multiple logistic complexities involved. A secure system that prevents the fuel from being stolen from the tanker is proposed. The system involves continuously monitoring the fuel level in the storage tank of the tanker. When the fuel drops below a specified limit, an alert will be sent to the driver and the fuel agency. A keypad security system based on dual password authentication acts as the first layer of security. A GPS module enables authorities to monitor the location of the truck through a mobile application. The novelty of the proposed system is IOT (Internet of Things) enabled security system which will ensure the communication between the sender and receiver parties and after confirmation, fuel would be dispensed. This system will help play an important role in the prevention of fuel theft. The Internet of Things (IOT) is defined as a paradigm in which objects equipped with sensors, actuators, and processors communicate with each other to serve a meaningful purpose. In this paper, we survey state-of-the-art methods, protocols, and applications in this new emerging area. This survey paper proposes a novel taxonomy for IOT technologies, highlights some of the most important technologies, and profiles some applications that have the potential to make a striking difference in human life, especially for the differently abled and the elderly. As compared to similar survey papers in the area, this paper is far more comprehensive in its coverage and exhaustively covers most major technologies spanning from sensors to applications.

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II. LITERATURE SURVEY

1)Sensor Based Electrical Smart Bike:

The SDF Server collects information from all ATUs using a constant polling cycle, produces fused estimates of the position and velocity of each moving target, and tracks these targets using a multi-target tracking algorithm. It also produces a synthetic ground situation display, collects statistical information about the moving targets and provides alerts when specific situations (e.g. Bikes) are detected.

2)Integrated distribution for wireless sensor networks:

Many sensor network applications require nodes to collaborate to ensure complete sensor coverage or route data to the network's edge a small set of nodes whose continued operation is threatened by low batteries can have a disproportionate impact on the fidelity provided by the network as a whole. In the most extreme case, the loss of single sink node may

render the remainder of the network unreachable. While previous research has addressed reducing the energy usage of individual nodes, the challenge of collaborative energy management has been largely ignored. It integrates into the sensor network application by providing an API allowing components to evaluate their impact on other nodes. The connection between the behavior of each node and the application's energy goals, guiding the network toward states that improve performance.

III. SYSTEM STUDY

Curbs or sidewalks (in addition to road surface markings) are clues that are exploited in positioning systems. Often they indicate the boundary of parking areas. Technologies that canaccurately detect and estimate curb location and height are embedded in any assist/autonomous parking systems: they enable to predict the vehicle-to-curb distance, hence to avoid a potential collision between the curb and the vehicle, cause of damages on tires and bumpers. The constraints put on such systems are very high: near-zero false negative detection, distance and height estimation with centimeter accuracy.

1)Existing System

This section presents a use case with charging and reverse charging scenarios. The energy flexibility offered by the fleet can be negotiated with a broker. This asset is in charge of this tradeoff.

2)Proposed System

In intelligent transport systems, connectivity of vehicle is the main feature for improving services to the driver and passengers. In Electric Vehicle domain, permanent connectivity is paramount in order to compensate both the limited range and to achieve an effective grid inclusion enabling the availability of electric energy everywhere anytime.

IV. SYSTEM DEVELOPMENT

1)POWER SUPPLY:

Power supply is a reference to a source of electrical power .A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU.

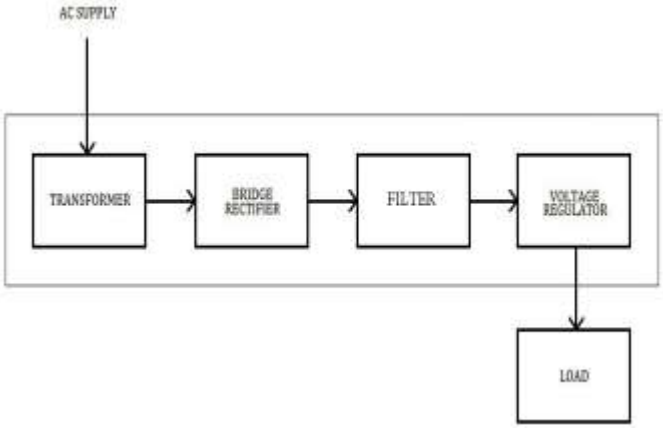

Fig 1. Block diagram of Power supply

The term is most commonly applied to electrical energy supplies. Less often to mechanical ones and rarely to others.

2) Schematic diagram:

The schematic diagram of power supply is given below.

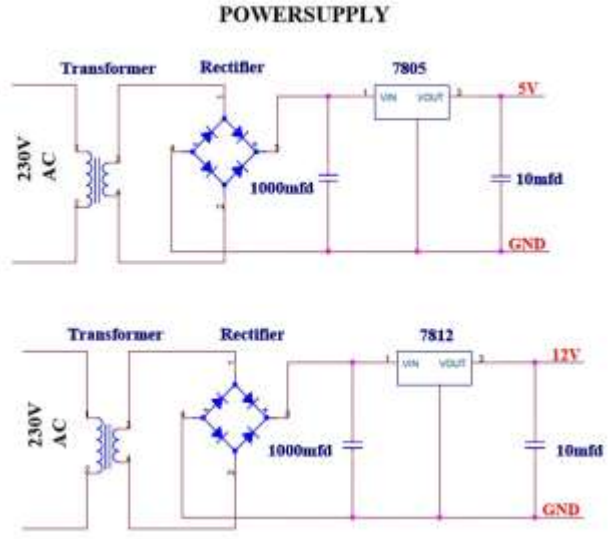

Fig 2. Schematic diagram of Power supply

3) GSM:

GSM stands for Global System for Mobile Communication. It is a digital cellular technology used for transmitting mobile voice and data services.GSM is a circuit-switched system that divides each 200 kHz channel into eight 25 kHz time-slots. GSM operates on the mobile

communication bands 900 MHz and 1800 MHz.GSM makes use of narrowband Time Division Multiple Access (TDMA) technique for transmitting signals.GSM was developed using digital technology. It has an ability to carry 64 kbps to 120 Mbps of data rates. Presently GSM supports more than one billion mobile subscribers.GSM digitizes and compresses data, then sends it down through a channel with two other streams of user data, each in its own timeslot.

4) GSM Carrier Frequencies:

GSM networks operate in a number of different carrier frequency ranges (separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G), with most 2G GSM networks operating in the 900 MHz or 1800 MHz bands. Where these bands were already allocated, the 850 MHz and 1900 MHz bands were used instead (for example in Canada and the United States). In rare cases the 400 and 450 MHz frequency bands are assigned in some countries because they were previously used for first-generation systems.

Most 3G networks in Europe operate in the 2100 MHz frequency band. For more information on worldwide GSM frequency usage, see GSM frequency bands.

Regardless of the frequency selected by an operator, it is divided into timeslots for individual phones.

This allows eight full-rate or sixteen half-rate speech channels per radio frequency. These eight radio timeslots (or burst periods) are grouped into a TDMA frame. Half-rate channels use alternate frames in the same timeslot. The channel data rate for all 8 channels is 270.833 kbit/s, and the frame duration is 4.615 ms.

5) GSM Architecture:

A GSM network consists of several functional entities, whose functions and interfaces are defined. The GSM network can be divided into following broad parts.

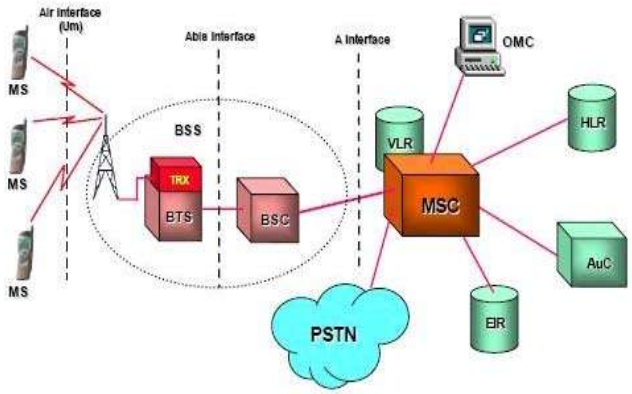

Fig 3. GSM Architecture

- Mobile Station (MS)
- Base Station Subsystem (BSS)
- Network Switching Subsystem (NSS)
- Operation Support Subsystem (OSS)

The GPRS core Network (the optical part which allows packet based on internet connections).The operations support system (OSS) for maintenance of the network.

6) GSM Kit:

This is a plug and play GSM Modem with a simple to interface serial interface.

Fig 4. Diagram of GSM Kit

Use it to send SMS, make and receive calls, and do other GSMoperations by controlling it through simple AT commands from micro controllers and computers. It uses the highly popular SIM800 module for all its operations.

It comes with a standard RS232 interface which can be used to easily interface the modem to micro controllers and computers.

The modem consists of all the required external circuitry required to start experimenting with the SIM800 module like the power regulation, external antenna SIM Holder, etc.

7)Features:

- Uses the extremely popular SIM800 GSM module
- Quad band 850/900/1800/1900MHz
- GPRS multi-slot class 12/10
- GPRS mobile station class B
- Compliant to GSM phase 2/2+
- Class 4(2 W @ 850/900 MHz)
- Class 1(1 W @ 1800/1900 MHz)
- Provides the industry standard serial RS232 interface for easy connection to computers and other devices
- Bluetooth: Compliant with 3.0+EDR
- Low power consumption
- Control via AT command (3GPP TS 27.007,27.005 and SIMCOM enhanced AT command)
- Provides serial TTL interface for easy and direct interface to

Microcontrollers Power, RING and Network LEDs for easy debugging

- Onboard 3V Lithium Battery holder with appropriate circuitry for providing backup for the modules' internal RTC
- Can be used for GSM based Voice communications, Data/Fax, SMS,GPRS and TCP/IP stack
- Module's operation mode can be controlled through the PWR Switch connected to the PWR pin (refer the SIM800 datasheet for more information)
- Comes with an onboard wire antenna for better reception. Board provides an option for adding an external antenna through an SMA connector
- The SIM800 allows an adjustable serial baud rate from 1200 to 115200 bps (9600 default)
- Modem a low power consumption of 0.25 A during normal operations and around 1 A during transmission
- Operating Voltage: 3.4– 4.4V AC or DC (board has onboard rectifier)

8) LCD DISPLAY:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.

These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD.

9) Pin diagram:

The LCD pin diagram is given below.

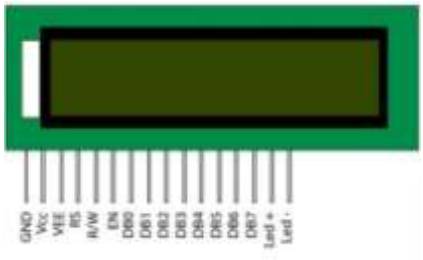

Fig 5 : Pin Diagram of LCD

10) Arduino:

Arduino is an open-source physical computing platform based on a simple I/O board and development environment that implements the processing/wiring language.

Arduino can be used to software on your computer (e.g. flash, processing, MaxMSP).the open-source IDE can be downloaded for free (currently for Mac OS X, Windows, and Linux).

The Arduino Mega is a microcontroller board based on the ATmega2560. It has 54 digital

input/output pins(of which 14 can be used as PWM outputs,16 analogs inputs,4 UARTs(hardware serial ports),a 16 MHZ crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

This controller is widely used for experimental and modern applications because of its low price, wide range of applications, high quality, and ease ofavailability.

It is ideal for applications such as machine control applications, measurement devices, study purpose, and so on.

11) Pin diagram:

Arduino Mega chip is available in different types of packages. According to the type of applications and usage, these packages are differentiated.

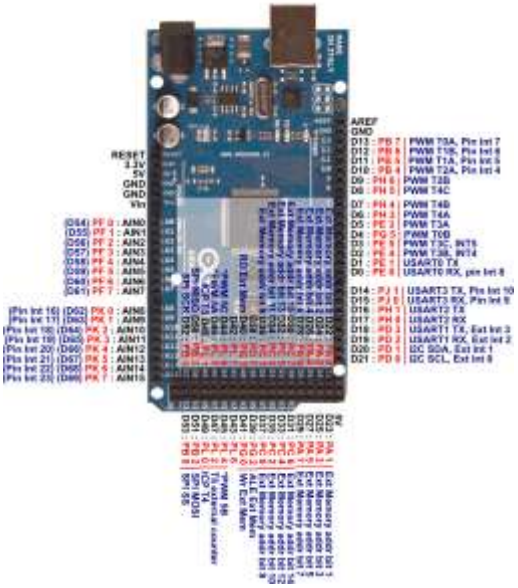

Fig 6. Pin Diagram of Arduino Mega

It operate at 5volts. Each pin can provide or receive a maximum of 40 mA and as an internal pull-up resistor (disconnected by default) of 20-50kOhms.

The Arduino board can operate on an external supply of 6 t0 20 volts. The Mega250 differ from all preceding boards in that does not use the FTDI USB-to-serial driver. Instead, it features the Atmega8U2 programmed as USB-to-serial converter.

12) Inputs and Outputs

Each of the 54 digital pins on the Arduino 2560 Mega. It can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions

Specialized functions

- Serial 0: 0(RX) and 1(TX);
- Serial 1: 19(RX) and 18(TX);
- Serial 2: 17(RX) and 16(TX);
- Serial 3: 15(RX) and 14(TX);

Used to receive (RX) and transmit (TX) TTL serial data. Pins 0 and 1 are also connected to the corresponding pins of the ATmega 16U2 USB-to-TTL serial chip.

The 54 input/output pins of which 14 can be used as PWM outputs, 16 analog inputs, 4 UARTs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

External interrupts

- 2(interrupt 0)
- 3(interrupt 1)
- 18(interrupt 5)
- 19(interrupt 4)
- 20(interrupt 3)
- 21(interrupt 2)

These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.

13) LED

The built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, its off.

A. TWI

20(SDA) and 21(SCL), this support TWI communication using the wire library. These pins are not in the same location as the TWI pins and the Duemilanove or Diecimila.The Mega2560 has 16 analog inputs, each of which provide 10 bits of resolution(i.e. 1024 different values). By default

they measure from ground t0 5volts, though is it possible to change the upper end of their range using the AREF pin and analog Reference() function.

B. AREF

Reference voltage for the analog inputs. Used with analog Reference( ).

C. RESET

Bring this lines LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

V. BLOCK DIAGRAM:

The block diagram of Arduino Mega microcontroller is shown below.

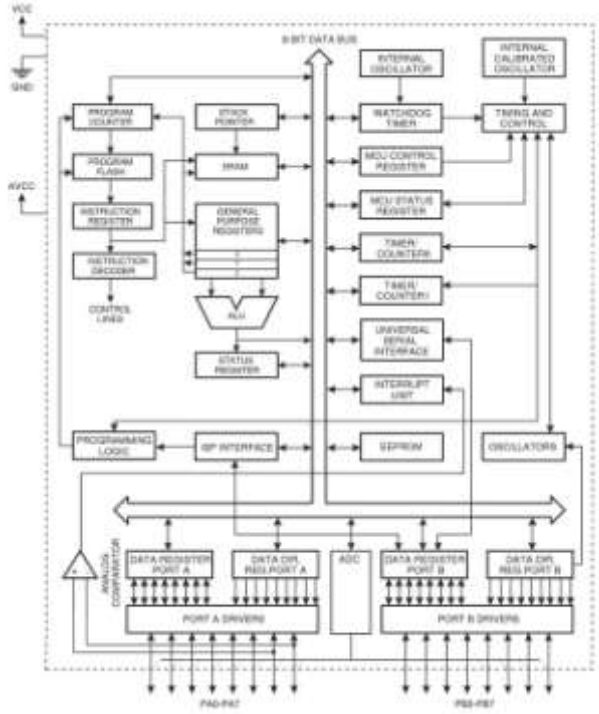

Fig 7. Block diagram of Arduino Mega

1) Features:

The Arduino Mega series has more advanced and developed features when compared to its previous series. The important features of Arduino Mega series is given below.

2) General features

- Operating Voltage is 5V
- Input Voltage is 7-12V
- 54 Digital Input Output Pins
- 16 Analog Input Pins
- Flash Memory is 256KB of which 8KB used by bootloader
- 8KB of SRAM
- 4KB of EEPROM
- 16MHz Crystal Oscillator

3) Special features:

- Protective case of Mega2560
- Fastened by 8 screws
- Made by premium acrylic
- Provides excellent protection, and fashionable appearance
- Unique design for Mega2560 with pin leakage, which provides easy connection to other components

4) Memory mapping:

The ATmega 2560 has 256KB of Flash memory for storing code (of which 8KB is used for the bootloader), 8KB of SRAM and 4KB of EEPROM (which can be read and written with the EEPROM library).

5) LED:

A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices and are increasingly used for general lighting. LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness.

When a light-emitting diode is switched on, electrons are able to recombine with holes within the device, releasing energy in the form of photons.

This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. An LED is often small in area (less than 1 mm^2), and integrated optical components may be used to shape its radiation pattern.

LEDs have many advantages over incandescent light sources including lower energy consumption,

longer lifetime, improved physical robustness, smaller size, and faster switching. However, LEDs powerful enough for room lighting are relatively expensive, and require more precise current and heat management than compact fluorescent lamp sources of comparable output.

Light-emitting diodes are used in applications as diverse as aviation lighting, automotive lighting, advertising, general lighting, and traffic signals.

Infrared LEDs also used in the remote control units of many commercial products including televisions, DVD players and other domestic applications. LEDs are also used in seven-segment display.

6) Technology:

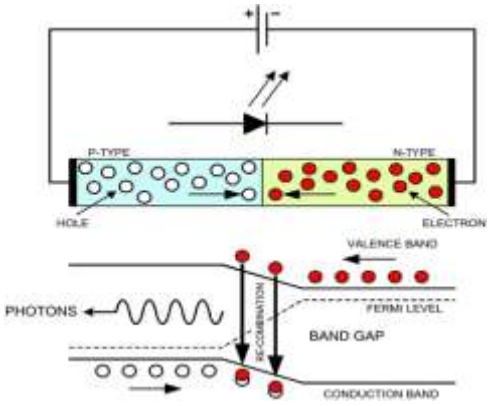

Fig 8. Diagram of LED Working

An LED will begin to emit light when the on-voltage is exceeded. Typical on voltages are 2-3volts.

Features:

- Long life
- Little power consumption
- Reduce an electricity bill
- Replaced existing lightings
- Low ultraviolet rays

7) RFID READER

A Radio Frequency Identification Reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio Frequency waves are used to transfer data from the tag to a reader. The RFID tag it must be within the range of an RFID reader, in order to be read. RFID technology allows several items to be quickly scanned and enables fast identification of a particular product, even when it is surrounded by several other items.

8) PRODUCT DESCRIPTION:

Radio frequency identification (RFID) is one method for Automatic Identification and Data Capture (AIDC). RFID tags are used in many industries. An RFID system consists of three components: an antenna and transceiver and a transponder. The antenna uses radio frequency waves to transmit a signal that activates the transponder. When activated, the tag transmits data back to the antenna.

An RFID reader's function is to interrogate RFID tags. The means of interrogation is wireless and because the distance is relatively short; line of sight between the reader and tags is not necessary. A reader contains an RF module, which acts as both a transmitter and receiver of radio frequency signals. The transmitter consists of an oscillator to create the carrier frequency; a modulator to impinge data commands upon this carrier signal and an amplifier to boost the signal enough to awaken the tag. The receiver has a demodulator to extract the returned data and also contains an amplifier to strengthen the signal for processing. A microprocessor forms the control unit, which employs and operating system and memory to filter and store the data. The data is now ready to be sent to the network.

Fig 9 : RFID Reader

FEATURES:

- Supply voltage: 12v DC
- Output: UART and TTL
- In-built buzzer indicator

- Signal LED is placed

VI. SIM COM GSM/ VOICE MODEM:

1) GENERAL DESCRIPTION

This GSM Modem can work with any GSM network operator SIM card just like a mobile phone with its own unique phone number. Advantage of using this modem will be that its RS232 port can be used to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily using this.

The modem can either be connected to PC serial port directly or to any microcontroller through MAX232. It can be used to send/receive SMS and make/receive voice calls. It can also be used in GPRS mode to connect to internet and run many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging.

2) PRODUCT DESCRIPTION

This GSM Modem can accept any GSM network act as SIM card and just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. The SIM800C is a complete Dual-band GSM/GPRS solution in a SMT module featuring an industry-standard interface, the SIM800CS is a quad-band GSM/GPRS module that works on frequencies GSM850MHz, delivers performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption.

Fig 10. GSMvoicemodem

FEATURES:

- High Quality Product
- RS232 interface @ RMC Connector for direct communication with computer or MCU kit
- Configurable baud rate
- SMA connector with GSM Antenna.
- SIM Card holder.
- Built in Network Status LED
- Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS.
- Audio interface Connector
- Normal operation temperature: -20 °C to +55 °C
- Input Voltage: 4.5V-12V DC

3) APPLICATIONS

- short message service(SMS)
- incoming/outgoing voice calls
- internet
- SMS based Remote Control and Alerts
- Security Applications
- Sensor Monitoring
- GPRS Mode Remote Data logging

The Dairy is a web based application. It will provide a forum for consultation and parent feedback through discussion that will help to guide the dairy in their decision making process which leads to a very high degree of system efficiency.

VII. SOFTWARE DESCRIPTION

1) ARDUINO IDE:

Arduino is an open source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs – light on a sensor, a finger on an button, or a twitter message- and turn it in to an output – activating a motor, turning on a LED, publishing something online.

2) Language tools:

Language tools are programs such as cross-assemblers and cross-compilers. Most people are familiar with language tools that run on a PC such as Visual Basic or C compilers. When using language tools for embedded systems, a "cross-assembler" or "cross-compiler" is used. These tools differ from typical compilers in that they run on a PC but produce code to run on another microprocessor, hence they "cross-compile" code for a microcontroller that uses an entirely different set of instructions from the PC. The language tools also produce a debug file that ARDUINO IDE uses to correlate the machine instructions and memory locations with the source code. This bit of integration allows the ARDUINO IDE editor to set breakpoints, allows watch windows to view variable contents, and lets you single step through the source code. The smaller the code produced, the better, because that allows the smallest possible memory for the target, which reduces cost. This means that techniques to optimize and enhance the code using machine specific knowledge are desirable.

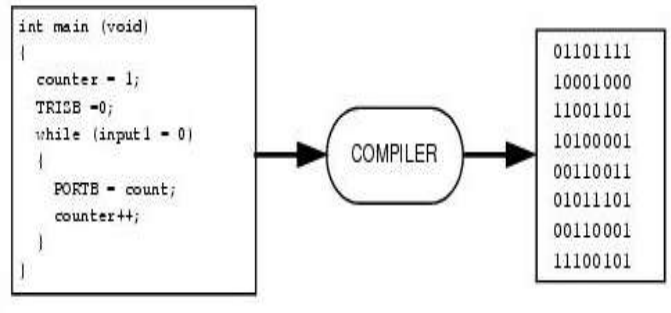

Fig 11. Diagram of Compiler Process

The size of programs for PCs typically extends into the megabytes for moderately complex programs. The size of simple embedded systems programs may be as small as a thousand bytes or less. A medium size embedded system might need 32K or 64K of code for relatively complex functions. Some embedded systems use megabytes of storage for large tables, user text messages or data logging.

Features:

- Create and edit source code using the built-in editor.
- Assemble, compile and link source code.
- Debug the executable logic
- Make timing measurements with the simulator or emulator.
- Program firmware into devices with device programmers

Advantages:

- Inexpensive
- Cross – platform
- Simple, clear programming environmenT
- Open source and extensible hardware/software.

3) IOT

Fig 12. Image related to IOT

The Internet of things(IOT) is the network of physical devices,vehicles,home appliances and other items embedded with electronics, software, sensors, actuators and connectivity which enables these objects to connect and exchange data.Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing internet infrastructure.

The online capable devices increased 31% from 2016 to 8.4 billion in 2017.Experts estimate that the IOT will consist of about 30 billion objects by

2020.It is also estimated that the global market value of IOT will reach $7.1 trillion by 2020.

The IOT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer based systems,and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.When IOT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems,which also encompasses technologies such as smart grids,virtual power plants, smart homes, intelligent transportation and smart cities.

"Things", in the IOT sense,can refer to a wide variety of devices such as heart monitoring implants,biochip transponders on farm animals,cameras,streaming live feeds of wild animals in coastal waters,automobiles with built-in sensors,DNA analysis devices for environmental/food/pathogen monitoring,or field operation devices that assist firefighters in search and rescue operations.Legal scholars suggest regarding "things" as an "inextricable mixture of hardware, software, data and service".

4) Definition of IOT:

These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices.

The term "the Internet of things"was coined by Kevin Ashton of Procter& Gamble,later MIT's Auto-ID Center,in 1999.

5) Architecture

The system will likely be an example of event-driven architecture,bottom-up made (based on the context of processes and operations,in real-time) and will consider any subsidiary level.Therefore,model driven and functional approaches will coexist with new ones able to treat exceptions and unusual evolution of processes(multi-agent systems,B-ADSc,etc).

6) General IOT Architecture:

In an Internet of Things, the meaning of an event will not necessarily be based on a deterministic or syntactic model but would instead be based on the context of the event itself: this will also be a semantic web. Consequently, it will not necessarily need common standards that would not be able to address every context or use: some actors (services, components, avatars) will accordingly be self-referenced and, if ever needed, adaptive to existing common standards (predicting everything would be no more than defining a "global finality" for everything that is just not possible with any of the current top- down approaches and standardizations).

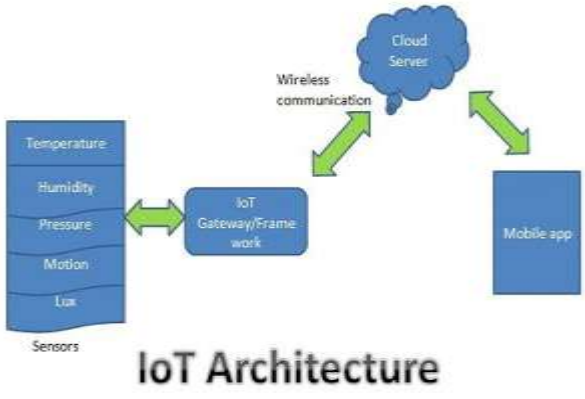

Fig 13. IOT Architecture

VIII. CONCLUSION

Electric Bikes is launching a new revolution in the automotive domain. These cars request a new suitable infrastructure. For this reason, it is mandatory to add new communication channels in the car in order to communicate with the infrastructure. However, privacy and security

leakages has to be considered. This paper has presented a risk analysis in order to evaluate the potential attacks. It threats have been identified and some countermeasure has also be proposed in order to reduce the risk encountered by the system. Finally, current legal framework is not suitable with these new technologies. This paper has presented a status of the current situation. In particular, authors point out the emerging legislation.

SCOPE FOR FUTURE ENHANCEMENT

In intelligent transport systems, connectivity of vehicle is the main feature for improving services to the driver and passengers. In Electric Vehicle domain, permanent connectivity is paramount in order to compensate both the limited range and to achieve an effective grid inclusion enabling the availability of electric energy everywhere anytime.

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