RASPBERRY PI PROJECTS
(Build your skils in Linux OS and Raspberry pi with real time projects)

It is a wonderful opportunity to learn one of the powerful open source operating system along with embedded system design using Raspberry pi   you'll learn starting from fundamentals such as user accounts, UNIX permissions and access control. You'll gain confidence in finding your way around Linux system installations using standard Linux commands.

You'll become familiar with the vi editor and be able to use it proficiently to create and modify files. You'll learn, the principles of how Linux boots, both on PCs (GRUB, LILO) and on embedded systems (U-Boot).

You'll get a good introduction to working with the standard Unix tools and utilities (including the BusyBox toolset on the RaspberryPi). You'll also learn how to set up and configure disk based, in memory, and flash file systems.

You'll gain the skills needed to configure ethernet and serial communications ports and TCP/IP networking. And you'll learn how to use package managers (both RPM and APT) to install software.

Overview:

 Raspberry Pi is a card sized Computer developed in the U.K by the Raspberry Pi Foundation for easy to develop low cost OS based embedded devices. Its based on ARM MPU and we can port Raspbian(linux) , android, fedora, ubuntu etc on raspberry pi.The raspberry is come with the python platform and it also support the c.

 The Raspberry Pi has a Broadcom BCM2835 system on a chip. which includes an ARM1176JZF-S 700 MHz processor , VideoCore IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term
storage, And can be boot from network.

1. **An emergency rescue dispatch system for road vehicles for instant notification of road accidents and post crash analysis.**

   Our research has been targeted towards building an **integrated** system for emergency rescue services in the event of a road accident. The project focuses on building an infrastructure which vehicle safety authorities can implement to enhance the reporting of vehicle crashes, provide post-crash analysis using motion sensors, record of the event in images and reduce the time it takes for emergency rescue to arrive at the crash location. We have achieved this using existing cellular network infrastructure already in place and also using GPS to pinpoint the exact location of the crash and send that data to an emergency rescue authority (such as Hospital, Fire Department, Police) using GSM text service. Our target was to build a low cost device that everyone can afford and use in their vehicles.

2. **Design and development of android mobile based bus tracking system.**

   Tracking of organization buses while moving on highway is a crucial task. A person patiently waiting for the bus may want to enquire about the position of current location of the bus. Phone discussion is not always possible due to traffic disturbances. Further it involves variant costs due to the calls and message service over phone and the person in the bus may get annoyed if he gets multiple calls from people boarding that bus. Mobile based Bus Tracking System provides a solution to this problem which helps anyone to retrieve the location of the bus without calling or disturbing the person travelling in the bus. The people boarding the bus and the coordinators of the bus should own an android driven mobile phone with internet connectivity. The Global Positioning System (GPS) supports in area following with backing of Global Standard for Mobile(GSM) in cellular telephone to report transport area information again to the servers. Continuously, this shows where transports are on a guide and evaluation the entry time and separation with reference to holding up stop by utilizing propelled gimmicks of Internet. The function of proposed system is to provide an economical, flexible and reliable system for bus tracking.

3. **GPS based real time Emergency Aid System with analysis of latency in satellite communication**

   Around 4.2 million people commute by vehicles every day. The breakdowns and accidents augment the traffic woes, adding to the misery of these commuters. In order to obtain control over these situations, immediate assistance should be extended. This paper proposes an `Emergency Aid System (EAS) and Remote tracking of Vehicles', which ensures prompt assistance in case of unfortunate events like accidents and breakdowns. This is possible by sending an SMS to the nearest service aid station via 2G technology. The system implements latest technology of GSM modem with a sufficient baud rate and a GPS antenna that continuously tracks the coordinates of the vehicle. The complete analysis of the system, along with the study of time taken (latency) in exchanging the data between the GPS antenna and Satellite is studied and the results are presented.

4. **Vehicle location finder using Global position system and Global System for Mobile**

Each year, the number of stolen vehicle is on the rise. Usually, to prevent theft, a physical type countermeasure is used such as padlock, disk break lock and other more which is a preventive action but it is not enough safe. The objective of this study is to create a controllable systemthat can display the location of vehicle using Global position system (GPS) to pin point the location and Global System for Mobile (GSM) as a mean for communicating with the vehicle for ease of finding after a theft attempt. The system is made to test the accuracy of the location that is send to the user when the vehicle is in motion and stationary in the city and suburb. The system is made by combining a micro controller with GPS and GSM, then comparing it with other similar device available in the market like Garmin and a reference website to find the radius of error. The study of proposed device begins by studying IEEE journal about alternative product and the vehicle itself. The hardware and program development is done by research and trial and error as the controller do not interact with both module at the same time, after successfully programming both module, it is combined into a single program with addition of interrupt program. The experiment is done in three set of tests so that the system accuracy can be determine when stationary and in motion on vehicle, output controlling is the test to determine if the controller can be made into anti-theft system. The result of the test concludes that the system can provide standard GPS coordinate when requested via Short Message Service (SMS). The system can also be used to control an actuator

5. Real time metropolitan bus positioning system design using GPS and GSM

The Real Time Bus Monitoring and Passenger Information bus tracking device is a standalone system designed to display the real-time locations of the buses in metropolitan city. This system will enable the tracking device to obtain GPS data of the bus locations, which will then be transferred to a centralized control unit by using GSM and then transmitted to a bus stop and displayed on the GLCD as per the passenger's request. The existing systems find it inconvenient to reschedule their times in events of a vehicle break down and congestion of roads. This causes uncertainty to passengers about the arrival time of buses. But the proposed real time bus monitoring system can overcome these disadvantages of the already existing systems.

6. ARM11 based RFID access control system with Live Image Capture
7. Optical Flow Motion Detection on Raspberry Pi

This paper presents the implementation of Optical Flow Motion Detection algorithm on Raspberry Pi.The Lucas- Kanade method was chosen for the implementation. The algorithm works by comparing two successive image frames. To find out a displaced object, the algorithm tries to guess the direction of displaced object rather than scanning the second image for the matching pixel. This can be done by solving for the optical flow vector by assuming that the vector will be similar to a small neighbourhood surrounding the pixel. The algorithm was simulated using Python OpenCV. The implementation of Lucas- Kanade algorithm was successfully done on Raspberry Pi.

8. The design and implementation of circuit breaker on-line monitoring device

This paper designed a circuit breaker on-line monitoring system based on S3C2440A core controller. With the high speed and high precision extended A/D, this device can sample signals on real time. It is fast, easy networking and convenient for remote data transmission by Ethernet. The embedded linux operating system, which can be cut arbitrarily and easy to translate, is used in this device. This monitoring system has complete functions, and has the advantages of user management and real-time multitasking. Tests show that the system can sample quickly and accurately, and transmit data fast and safely. System's anti-interference ability is strong, performance is stabilized and the bit error rate is low. So, it is better than the traditional 485 communication way

9. Raspberry Pi based interactive home automation system through E-mail

Automation is becoming more and more popular day by day due to its numerous advantages. This can be achieved by local networking or by remote control. This paper aims at designing a basic home automation application on Raspberry Pi through reading the subject of E-mail and the algorithm for the same has been developed in python environment which is the default programming environment provided by Raspberry Pi. Results show the efficient implementation of proposed algorithm for home automation. LEDs were used to indicate the switching action.

10. Design of a solar tracking system for renewable energy

In this paper, a solar tracking system for renewable energy is designedand built to collect free energy from the sun, store it in the battery, and convert this energy to alternating current (AC). This makes the energyusable in standard-sized homes as a supplemental source of power or as an independent power source. The system is designed to respond to its environment in the shortest amount of time. Any source of error at both the software and the hardware level is eliminated, or at least controlled. The system is tested for real-time responsiveness, reliability, stability, and safety. The system is designed to be stable while it is operating. It is alsodesigned to be resistant to weather, temperature and minor mechanical stresses. Furthermore, the system is fail-safe; it can recover from failures or at least indicate that it is in that condition

11. A plug-n-play internet enabled platform for real time image processing

A plug-n-play internet enabled platform for real time simulation of imageprocessing algorithms (like CNN) is demonstrated on the Bit by Bitplatform. The prototyping platform uses Raspberry Pi, thereby enablingcollaboration and sharing of the image processing simulation experiments and results over the internet. These algorithms can be applied to the realtime captured images and results are displayed instantly over the internetor via email

12. Real Time Operating System on embedded linux with ultrasonic sensor for mobile robot

This research goal is to analyze Real Time Operating System (RTOS) performance on Single Board Computer for wheeled mobile robot. RTOS have better system response than General Purpose Operating System(GPOS), this system response is important for mobile robot, for examplemobile robot should stop as soon as possible when the sensor detect the wall. RTOS system analysis on SBC covers several points such as, distance measurement precision resulted by the sensor, the value of latency resulted, and data renewal process due to system interaction on the environment surrounding by ultrasonic sensor. Achieved results show RTOS with Qt-based program and using multithread is well implemented on the SBC, proven by the robot's ability to respond less than 1 second. This result can be accounted as soft real time system. Cyclictest results for proving RTOS and GPOS (General Purpose Operating System) performance shows average latency difference between both systemsare up to 300us where RTOS are only 9 us.

13. Smart home automation system for energy efficient housing

This paper presents a concept and implementation of modern smartmonitoring and control system for building automatization. The system is designed to enable significant reduction of energy consumption and carbon footprint by increasing the energy efficiency of the building under control. The system consists of a Linux-based remotely accessible main embedded control unit, a custom designed programmable logic controller named littlePLC, and a propriatery low-power Wireless Sensor Network (WSN). The energy flow is optimized by using a Model Predictive Control (MPC) algorithm that runs on the main control unit. The main control unit communicates with littlePLC, which serves as an interface that controls the parameters and state of HVAC systems in the building. The feedback information for MPC is gathered by means of the WSN, which consists of various sensor node types, such as temperature, air pressure, humidity, VOC and CO_2. The WSN nodes are connected in a star type network topology, with a communication HUB connected to the main control unit. The information gathered by WSN are used in the MPC algorithm in order to calculate and estimate the requirements for heat corrections, with respect to ventilation and weather predictions.

14. Liquid level control of Coca-Cola bottles using an automated system

This paper describes the automation process of filling level control forCoca-Cola bottles, through digital image processing. To perform this, anautomated system was implemented on ODroid-X2, on the Ubuntu distribution, Linux. In addition, the creation of a prototype that simulates the physical conditions of the plant, located in the city of Bucaramanga. The automated system has embedded software developed in python, which determines whether the bottle has the right level of liquid. If thelevel is incorrect the system automatically rejects the bottle

15. Design of tracked robot with remote control for surveillance

For specific purpose, tracked robot that can be controlled remotely and able to acquire images from environment is very important, for example in rescuing disaster victims. We

propose architecture for Raspberry pi and AVR-based mobile robot that can
be controlled by low cost remotecontroller Integrated Circuits(IC) and able to avoid
obstacles using ultrasonic distance sensor. This prototype also can be used for education
and research in the university. We evaluate the performance of the robotin terms of the
distance and the capability to deliver video streaming from the output raspberry pi and
2.4 GHz Video transmitter.

16. Design of Greenhouse Temperature Detection System Based on Linear Offset
Interference

The agricultural industry continues to expand to a large scale, and the number
of greenhouse is increasing. In order to improve the production, the control of
the greenhouse is extremely important. The greenhouseenvironment system is complex,
and the mutual coupling between the various environmental factors is surviving.
Therefore, the conventionaltemperature detection and control method is difficult to provide
optimal environmental temperature for vegetables and other crops. Aimed to detect
the greenhouse temperature, and provide a basis for effective and accurate control
of greenhouse temperature, an effective and
improvedgreenhouse temperature detection system is designed based on linearoffset interference prin
ciple. The detected interference fringes are collected in video. The collected images are loaded in the
embeddedsystem through the data and image processing technology. The peripheral support circuit of
embedded core processor is designed. Thelinear model of fringe travel and the temperature is
established based onlinear offset interference. The image acquisition is processed for
theinterference fringe by CCD camera, and the images are transmitted in the core controller. The core
controller takes the ARM9 embedded chip S3C2410 as the processing chip. It is has better advantages
of parallel processing and real-time performance than the traditional DS18B20temperature controller,
which meets to the temperature control requirements of greenhouse. The fringe travel value is
obtained with processing on thermal image. And the temperature value of thegreenhouse is obtained
precisely. Experiment is taken on 10 different test points, and experiment results show that the
accuracy is maintained in the range of 0.02, the system and temperature detection method has
prospective application value in agricultural production and greenhousecultivation

17. Design and implementation of a low-cost embedded Linux gateway for smart
home health monitoring

Many wireless sensor network applications require a gateway device to interface with
services running on the Internet. Because of the software complexity involved in this
device, it is often realized using a real-time operating system running on an application
processor. Most systems burden the user with developing the protocol handling and
device configuration and management inside the application. In this paper, we present the
Angelos Gateway - a turnkey, low-cost, Linux-powered WSNgateway that provides a socket-based
environment for rapid network-enabled application development. Experimental results demonstrate

that the proposed device is capable of high-throughput packet I/O confirming the efficacy of the proposed implementation.

18. **Face identification implementation in a standalone embedded system**

In this paper is described an embedded system for face identification. The system, running on FPGA, is built around LEON3 processor and consists of several IP (Intellectual Property) modules designed as AMBA bus peripherals. The face detection is accelerated with the help of a hardware module while the face recognition is entirely executed in software. The face detection hardware accelerator module is reconfigurable and can share its internal resources (memory, multiplier, integer square root unit) with the LEON3 processor. The system has been designed on the criteria of resources optimization, low power consumption and improved operation speed

19. **Android based smart home system with control via Bluetooth and internet connectivity**

Automation plays an important role in today's human life and people's life is gradually changing with smart living due to modern technology development and Android Smartphone. This paper presents a low-costSmart Living System, which uses Android based User Interface for controlof home appliances. Connection to the smart living system can be made from the designed app via Bluetooth or internet connection. It also integrates home security and alert system.

20. **Automated electric meter reading and monitoring system using zigbee-integrated raspberry Pi single board computer via Modbus**

In recent years, automated meter reading systems (AMR) are being utilized in most developed countries like the United States and other European countries. The advantages these electric metering system offers make it a more accurate measuring device than the conventional electro mechanical meter reading system being used in developing countries like the Philippines. AMRs capacity to automatically transmit data realtime increases the reliability of this metering system, unlike electromechanical meters which occasionally make use of previous readings as a basis of the consumer's current billing. It also puts consumers at a disadvantage as the accuracy of power consumption readings is being compromised. The integration of ZigBee protocol in singleboard computer Raspberry Pi, through the programming language Python, has successfully facilitated the reading and wireless transmission of the voltage or power consumption of the user. Through Python, the raw data transmitted to the coordinator ZigBee is then converted to a CSV file, the data type required by the MySQL database for the received data to be uploaded in the website

21. **Using of Raspberry Pi for data acquisition from biochemical analyzers**

A large number of analyses performed in a biochemical laboratory requires that results of these analyses are automatically acquired from analyzers which can be of different types and produced by various producers. Automatic data acquisition prevents errors which are possible if results are manually transcribed into reports for patients. Beside this, acquired results are saved in database from where they are available to be used in electronic health record (EHR). Above requirement resulted in development of a solution for data acquisition from heterogeneous laboratory analyzers. Here we present the solution which is based on minicomputer Raspberry Pi model B, Raspbian OS, Mono Framework and a .NET Framework 4.0 console application written in C# programming language. Proposed solution is tightly connected with medical information system MEDIS.NET and with laboratory information system LabIS. In order to test whole concept we developed a laboratory simulator which completely implements protocol for biochemical analyzers. The emphasis is on an inexpensive solution which connects a large number of heterogeneous analyzers at a biochemical laboratory

22. Bluetooth communication using a touch screen interface with the Raspberry Pi

The Raspberry Pi is a low cost single-board computer which has recently become very popular. In this paper we showcase our attempt at building a low cost stand-alone device which transmits data using the RaspberryPi with Bluetooth and has a resistive touch screen display providing a user interface. The Raspberry Pi is controlled by a modified version of Debian Linux optimized for the ARM architecture. The display contains a graphical user interface which provides various fields for data entry via an onscreen keyboard. Also, various fields were provided to display data obtained from a remote host.

23. Development of Fire alarm system using Raspberry Pi and Arduino Uno

The proposed Fire alarm system is a real-time monitoring system that detects the presence of smoke in the air due to fire and captures images via a camera installed inside a room when a fire occurs. The embeddedsystems used to develop his fire alarm system are Raspberry Pi andArduino Uno. The key feature of the system is the ability to remotely send an alert when a fire is detected. When the presence of smoke is detected, the system will display an image of the room state in a webpage. The system will need the user confirmation to report the event to the Firefighter using Short Message Service (SMS). The advantage ofusing this system is it will reduce the possibility of false alert reported to the Firefighter. The camera will only capture an image, so this system will consume a little storage and power.

24. GPS data logger using Linux single board computer
25. Number plate recognition and automatic gate opening system using Raspberry Pi
26. Image processing based Vehicle Number plate recognition and alerting system
27. Design and development of online weather station and data upload to cloud in internet of things.
28. Web-browser controller robot using the Raspberry pi With this project, we demonstrate how to control a robot directly from the browser of any computer, tablet, or phone.

29. Twitter weather station Raspberry Pi weather and time station that Tweets the temperature and the time, using Python.
30. Raspberry Pi based Home Automation.
31. Sixth Sense Technology for Home automation.