Portable and Inexpensive Computer Using A Raspberry Pi

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Abstract— the Internet of Things – IoT, can be looked as a highly dynamic and radically distributed networked system. The presence of smart devices able to sense physical phenomena and translate them into a stream of information data, as well as the presence of devices able to trigger actions, maximizes safety, security, comfort, convenience and energy-savings. The Raspberry Pi brings the advantages of a PC to the domain of sensor network, what makes it the perfect platform for interfacing with wide variety of external peripherals.
The main purpose of this paper is to introduce an all-in-one and portable computational device. This computer is approximately 40% smaller than the laptop. This computer has complete and easy functionality as it contain the key components like a battery pack, a working motherboard, a display unit, a wireless keyboard and lastly a sleek case, all the components are assembled together.

Keywords: Raspberry, 7 inch IPS display, battery pack, wireless keyboard with inbuilt mouse.

I. INTRODUCTION

Raspberry Pi is a small, powerful, cheap, hackable and education-oriented computer board introduced in 2012. Emerging trends of user programming give the opportunity to non-professional end-users of making additions to products, according to their specific needs. There are hundreds of products available today that allow end-user programming. Using inexpensive hardware and open source software, it is possible to programmatically control many devices in such a way that own solution meets user needs. Moreover, providing techniques to end-users and the possibility to shape products according to their needs is beneficial for both users and product developers. In this work, one of prototype platforms which enable end-user programming will be considered. An emphasis will be on Raspberry Pi computer board making a comparative study of its performances and constraints with current popular prototyping platforms

Why R-Pi?

Raspberry Pi have shown that it is the perfect platform for a PC to the domain of sensor network, what makes it the perfect platform for interfacing with wide variety of external peripherals and using in wide range of applications.
Coupling it with WiFi and providing access to the Internet it is possible to set it up for a remote communication, what the Raspberry Pi makes very suitable for applications in IoT concept. Thus, the advantage of Raspberry Pi lies in its flexibility and endless possibility of its usage enabling at the same time end-users to program it according their needs and budgets. Hence the Raspberry Pi is the key component for the portable computer.
Even there are large differences between stated platforms in their ideal use cases, energy requirements, OS, etc., it can be noted that all of them can be very successively applied as IoT hardware components.

Name	Processor	RAM*	Power	Analog Input	Digital I/O Pins	USB Ports	LAN (Mbit)
Raspberry Pi	ARM BCM2835	256-512MB	5V/USB	0	14	1-2	10/100
Arduino	ATMEGA8, ATMEGA168, ATMEGA328, ATMEGA1280	16-32 KB	7-12 V/USB	6	14	1	-
BeagleBone Black	AM335x 1GHz ARM® Cortex-A8	512MB	5V	6	14	1	10/100
Phidgets	PhidgetsSBC	64 MB	6-15 V	8	8I+8O	6	-
Udoo (Quad)	Freescale i.MX6Quad, 4 x ARM® Cortex™-A9 core Atmel SAM3X8E ARM CortexM3 CPU	1 GB	6-15 V	14	62+14	5	10/100/1000*

TABLE: - COMPARISON OF THE RASPBERRY PI WITH OTHER IOT HARDWARE PLATFORMS

II. PROPOSED SYSTEM

**Essential components**

1) Raspberry Pi Model 3B
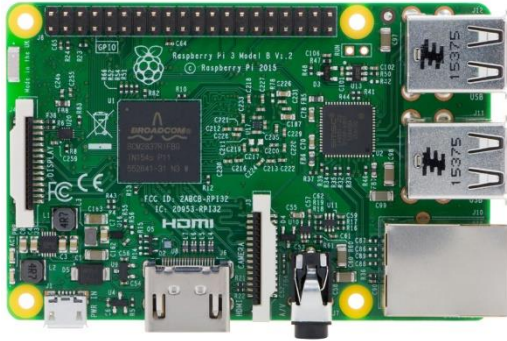
- The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B.
- While maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processor, 10x faster than the first generation Raspberry Pi.
- Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.

Specifications	Features
Broadcom BCM2387 chipset	Now 10x Faster - Broadcom BCM2387 ARM Cortex-A53 Quad Core Processor powered Single Board Computer running at 1.2GHz
Broadcom BCM2387 chipset	1GB RAM so you can now run bigger and more powerful applications
802.11 bgn Wireless LAN and Bluetooth 4.1 (Bluetooth Classic and LE)	Fully HAT compatible
1GB RAM, 64 Bit CPU	40pin extended GPIO to enhance your "real world" projects.
4 x USB ports, CSI camera port for connecting the Raspberry Pi camera	Connect a Raspberry Pi camera and touch screen display (each sold separately)
4 pole Stereo output and Composite video port	Stream and watch Hi-definition video output at 1080
Full size HDMI, 10/100 BaseT Ethernet socketbr	Micro SD slot for storing information and loading your operating systems.
DSI display port for connecting the Raspberry Pi touch screen display	10/100 BaseT Ethernet socket to quickly connect the Raspberry Pi to the Internet
Micro SD port for loading your operating system and storing data, Micro USB power source	

Table: - Specifications and Features of the Raspberry Pi Model 3B

2) 7 inch IPS display
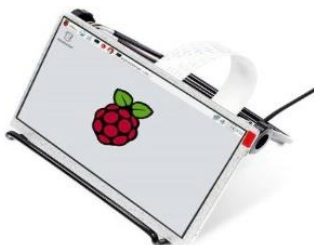
- HIGH RESOLUTION- The 7 inch IPS LCD Monitor with high resolution of 1024×600 pixels, supporting key operation
- WIDE VISUAL ANGLE- IPS screen features the wide visual Angle, fast response speed and accurate color rendition
- MULTIPLE INTERFACES: Supports multiple video input interfaces: HDMI, VGA and USB output of 5V/3A.
- Includes 3 pieces of transparent acrylic plate in different colors to protect the Raspberry Pi.
- RESERVED FIXING HOLES- Reserved fixing holes for control boards - suitable for Raspberry Pi 4 model B.

3) A circuit board made for the assembly of the battery pack.

4) 2 Lithium-ion 2200 mAh cells

5) White & Black acrylic sheets

6) A wireless keyboard with an attached mouse

- 2.4GHz (or Bluetooth) Mini Wireless QWERTY keyboard, TouchPad combo, with USB interface adapter
- It will go to sleep mode, if no operating after 3 minutes
- Easy to use, Plug and play via wireless usb reciever
- No need for a separate mouse to the built-in touchpad, which also works with Windows 8
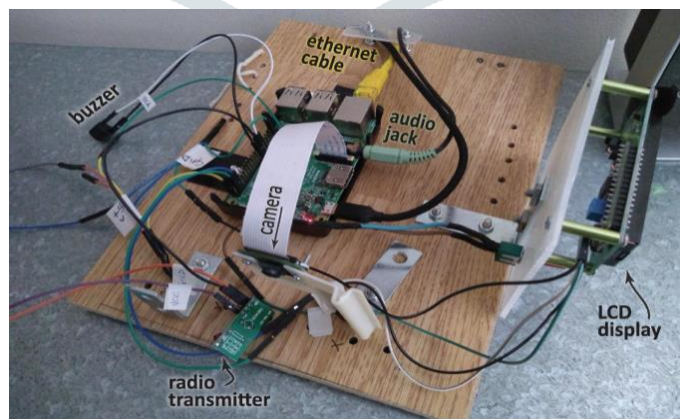
Experimental Setup

Figure: - Hardware Components Configuration

Proposed Work:-
i) Motherboard Assembly
(a) To start a computer we need to install OS. The option of the operating-system totally depends upon the sort of job that you do.
(b) To manage the compatibility between the screen and the motherboard the storage and code is modified/ customized.
(c) The case for the motherboard is reduced in a cuboidal form and the motherboard is glued inside
(d) Some layouts are managed for the ports and the cable connection

ii) Screen Assembly

(a) A cuboid was cut to place the screen.

(b) By using the acrylic case the display and the actual hardware will be safe from any damage.

iii) Battery Assembly

(a) Here we soldered 3 cells in parallel to each other for proper and sufficient current can pass through both motherboard and the screen

(b) Then, the battery was soldered to the power bank circuit board that would display the battery's power life and could charge the batteries

(c) A case was cut out of acrylic sheets and slots were added so that the LCD display showing the battery life could be visible.
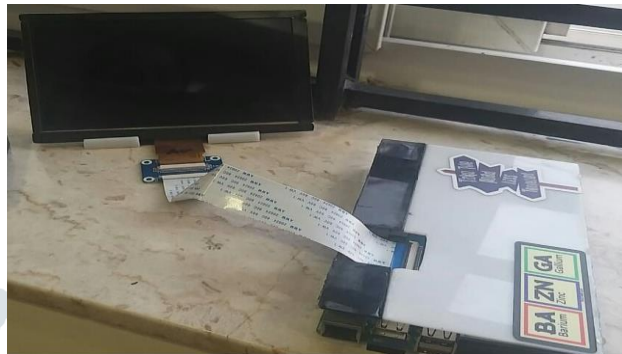
Figure: - Portable and Inexpensive Computer

III.   CONCLUSION

This computer is made to be used for educational purposes. It can be used to make word documents, spreadsheets & presentations. It can also access the internet and connect people to its resources. It can be used to learn how to write code and make software. Its main advantage is its affordability and portability. With a cost of manufacturing so low, it is much cheaper than most computers. Thus, a larger number of people can afford them.

Raspberry Pi's performances are compared with some popular boards and development platforms on a general level by computing power, size and overall costs of the solutions. Based on performed analysis, it can be stated that Udoo has the best performances among considered IoT hardware platforms, but at the same time its price is quite high.
 On the other side the detail analyses of Raspberry Pi have shown that it is the perfect platform for a PC to the domain of sensor network, what makes it the perfect platform for interfacing with wide variety of external peripherals and using in wide range of applications.

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