Raspberry Pi Basic Tutorial using Android Application for Beginner User

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Abstract: This paper describes the ideas of development a mobile application for learning Raspberry Pi. Raspberry Pi is a multi-functional micro-controller that not expensive than most video games, but with Raspberry Pi user can learn programming such as Phyton coding, build robots, and create all creative of amazing and beautiful projects. The Raspberry Pi is capable of doing all the things like other computer can do such as surfing the internet, watching movies, playing games and listening music. Raspberry Pi has become widely use new modern technology such smart house and smart factory. By embedding Raspberry Pi learning with mobile application such as Android Apps, users could face new and fun experiences. Hence, this paper presents the development of Android application of the raspberry Pi learning module. The main aim on this project is to develop Raspberry Pi training kit with structured module, develop Android application to embedded the Raspberry Pi training and provide an example of projects that can be built in the Raspberry Pi with different levels type. This can be the platform for beginner users to learn Raspberry Pi and improve their knowledge. The mobile application that used in this project is Thunkable.

Keywords: Mobile Application, Raspberry Pi, Thunkable.

1. Introduction

The integrated circuit (IC) device used for controlling different bits of an electronic framework, ordinarily through a microprocessor unit (MPU), memory, and a few peripherals is called micro-controller. These devices are advanced for inserted applications that require both preparing usefulness and lithe, responsive interaction with digital, analog, or electro-mechanical. Now a day, there were many types of micro-controller are available in market with various word length such as 4bit, 8bit, 64bits, and 128bits micro-controller. For example, Arduino and Raspberry Pi both are micro-controller. But, for Raspberry Pi has many functions but not often used in education compared to Arduino. The

Raspberry Pi is a multi-functional micro-controller. So, this project will use Raspberry Pi micro-controller as a main device for education and develop a mobile application for teaching how to use Raspberry Pi.

1.1 Raspberry Pi micro-controller

The Raspberry Pi micro-controller is a brand of tiny single-board computers developed by in the United Kingdom. The Raspberry Pi is a remarkable device which have a fully functional computer in a tiny and low-cost package [1]. This device can use to browse the web or play games, learn on how to write own programs, and create own circuits and physical devices. The Raspberry Pi is known as a single-board computer, which means like a computer, desktop, laptop, or smartphone, but it is built on a single printed circuit board. The Raspberry Pi is small like most single-board computers; it is same footprint as a credit card. The Raspberry Pi is not much powerful which it has a limit. Raspberry Pi is more power full than another basic computer. It can do anything a bigger and more power-hungry computer can do, though not necessarily as quickly. The Raspberry Pi have many features and functions. With Raspberry is not about using software as any computer. With Raspberry Pi can create own software, based on almost everything user imagination can conjure. The programming that available in Raspberry Pi such as Scratch, Python and others. With this kind of features user can enjoy and learn many things using the Raspberry Pi micro-controller.

1.2 Mobile Application Builder

The growth of information technology has developed significantly. These innovations have transformed the paradigm of society in seeking and acquiring information, not only through conventional media such as print, radio and television, but also may be accessed from numerous sources through internet network technology. The education sector is one of the domains which has a considerable effect on technological development [2-4]. The most commonly employed medium for a range of multimedia applications are Android-based smartphone devices [5-7]. Android has been built as a Linux operating system for mobile touch screen devices like smartphones and tablet PCs. Opensource Code and Android licenses allows unlimited modification and distribution of software by device makers, cellular carriers and app developers. To develop an application, of course a software either online or offline is required in several ways. There is some software that require developers to be proficient in coding and programming. So, to insert an element, special coding is used so that it can function and be displayed perfectly. However, there is also software that does not require coding, it only requires logical skills to insert the element provided by clicking and navigating only the element to perform any desired function such an example Thunkable application builder. Thunkable is a software that was revolutionized from an old software that is from App Inventor [8-9]. Thunkable can be used to develop and create an Android application by simply click, dragging, dropping components of code and navigation method using the website's platform only. It does not need to learn or master a programming language specifically.

2. Materials and Methods

Video or files upload in Android app
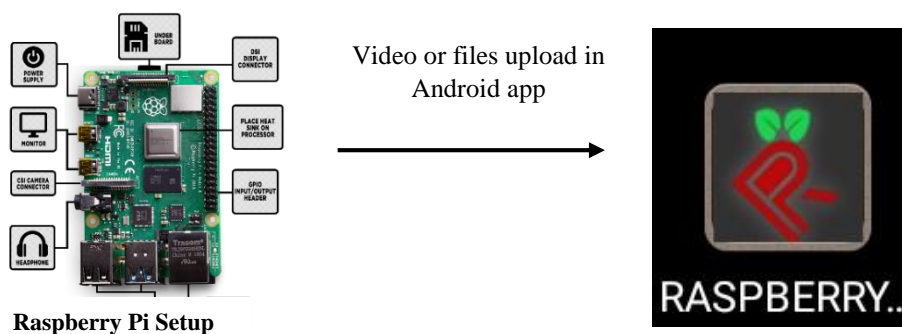
Raspberry Pi Setup

Android Apps Using Thunkable

Figure 1: Project Design Overview

2.1 Startup Raspberry Pi

Figure 1 shows the plan to design the Raspberry Pi Basic Tutorial using Android Application for Beginner User. The Raspberry Pi that used in this project is Raspberry Pi 3 model B. Raspberry Pi 3 Model B is the earliest model of the third-generation Raspberry Pi. The specifications of this Raspberry pi are; -

i.	Quad Core 1.2GHz Broadcom BCM2837 64bit CPU
ii.	1GB RAM
iii.	BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board
iv.	100 Base Ethernet
v.	40-pin extended GPIO
vi.	4 USB 2 ports
vii.	4 Pole stereo output and composite video port
viii.	Full size HDMI
ix.	CSI camera port for connecting a Raspberry Pi camera
x.	DSI display port for connecting a Raspberry Pi touchscreen display
xi.	Micro SD port for loading your operating system and storing data
xii.	Upgraded switched Micro USB power source up to 2.5A

The Raspberry Pi micro-controller must be connected to these devices; -

- Power supply - to get the power use Micro USB power supply (2.1A)
- Monitor - Use HDMI cable connect the monitor to the Raspberry Pi to get the display
- Micro SD card – SD card must be set up first such as reset and download the Raspberry pi OS from Raspberry pi website
- Keyboard and Mouse – to use and control Raspberry Pi features

All of these devices or component is necessary to startup the Raspberry Pi minicomputer. Others material is needed for this project is computer or smartphone to edit and download mobile application builder (Thunkable).
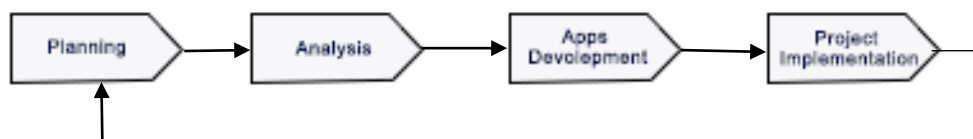
2.2 Mobile Application

Figure 2: Raspberry Pi education mobile apps flow

Figure 2 shows the block diagram for build Raspberry Pi education mobile apps flow. First, the planning phase have two main things to create an application for education purpose and to fill the Raspberry Pi input. The mobile application that has been use is Thunkable free use and can get at the Internet. Next, analysis must be done to startup the raspberry pi to become minicomputer. Figure 3 show the process to build an apps development. At editing design process, the infographic about Raspberry Pi and video Raspberry Pi project will be upload. The Raspberry Pi project will have two type of project based on different type of programming. Then, project implementation is to publish the

apps in the Play Store. This step can be done after of the process have finish. After publish the apps, user can download it on the Play Store via android smartphone.
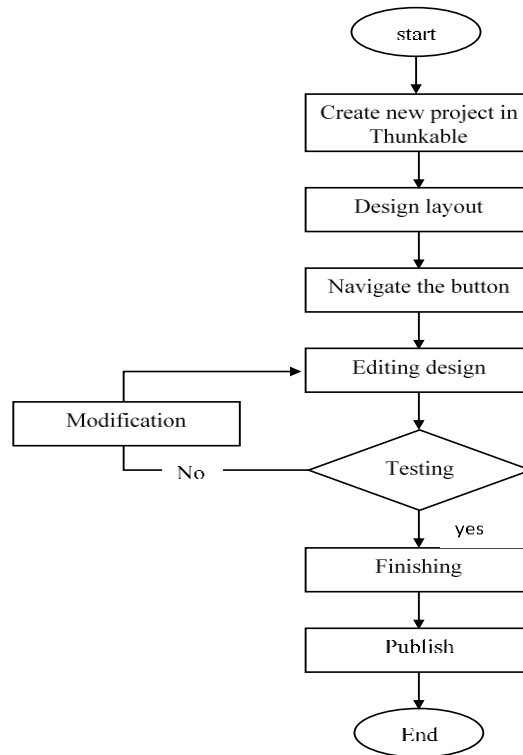

Figure 3: Flowchart of the process of Apps development

3. Results and Discussion

(a) Apps Logo   (b) Introduction   (c) Example of Tutorials

Figure 4: Raspberry Pi Training Kit Mobile Apps and Features

3.1 Raspberry Pi Training Kit Mobile Apps

Figure 4 (a) shows the Raspberry Pi mobile apps after user download it on a smartphone. This mobile app is free and can download at the play store. Figure 4 (b) (c) shows the features in this apps. This apps has five main feature that can be seen at the button of the display such as Home, Component,

Video, Mini Project, and about. For Home page, it will display the information about the Raspberry Pi such an introduction. The component page will explain the components or ports of the Raspberry Pi micro controller. For the Video page, it will have some video that will explain all the basic for the Raspberry Pi such as to startup Raspberry Pi, type of the Raspberry Pi and others. Next, mini project page will display the basic project that can be learn by using Raspberry Pi. This project provides two mini project such as Temperature Log and Scratch 3. Lastly, about page will conclude the information for the developer, editor and supervisor.

3.2 Mini project Raspberry Pi

In this apps, we have provided two examples of Raspberry Pi project with different level. These projects use different programming type that is easy to learn. With the Raspberry Pi user can learn programming but for beginner python and scratch is more easy for them.
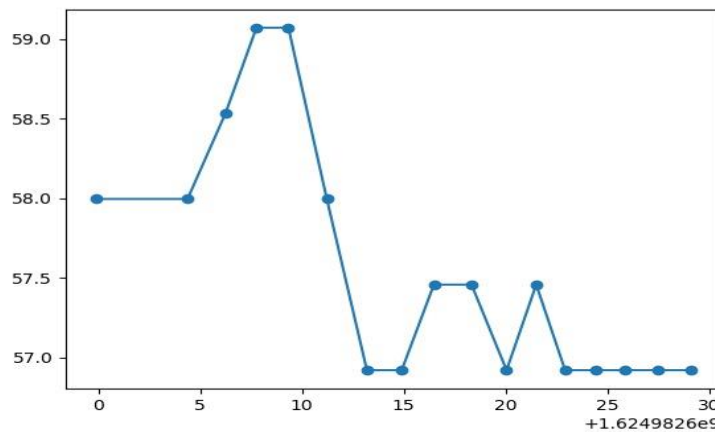
3.2.1 Temperature Log

Figure 5: The output of Temperature Log Project

We make a project about temperature log which is the system on a chip (SoC) of the Raspberry Pi has a temperature sensor that can be used to measure its temperature from the command line. This project objective is to create a simple Python script that can run automatically as you boot up your Raspberry Pi, take measurements from the temperature sensor at given intervals, and write them into log files that can be viewed later. You will also be able to get the data as an interactively plotted graph. Table 1 shows the data of the temperature log project. Basically, the data is depending to the what is used in the Raspberry Pi minicomputer. If the Raspberry Pi run the huge application such a game the temperature will increase.

Table 1: Data Table Temperature Log

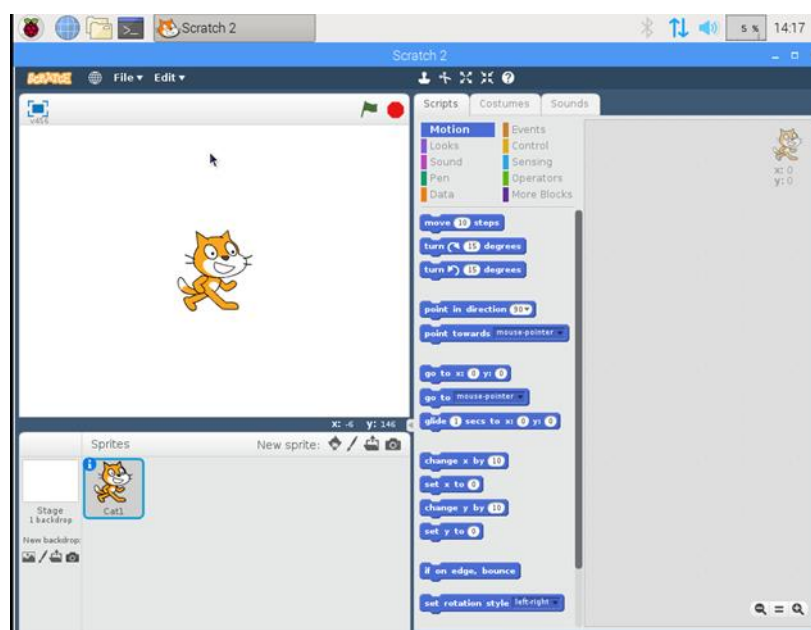| Time, s (x)	Temperature, °c (y)
0	58.0
5	58.0
10	59.0
15	57.0
20	57.0
26	57.0

3.2.2 Scratch 3

Figure 6: Scratch 3 application

Figure 6 shows the feature of the Scratch programming. The Scratch is a cross-program application originate from Raspberry Pi for the deal with a programming language. It is proposed to establish programming to a performer and other new users unfamiliar with software enhancement. It includes code editor with feature such us Motion, sounds, events, operators and other option of code that we can apply in fun way and uploading a package to the board with a specific click.

4. Conclusion

The process and flow to build a mobile app has been discussed properly. The Thunkable application builder can be used to develop and create an Android application by simply click, dragging, dropping components of code and navigation method using the website's platform only. It does not need to learn or master a programming language specifically. For the Raspberry Pi project, for the first project is using scratch 3 programming can learn on how to draw figure based on user style. Then user can set the command to move that figure put the effect sound and other animation to create creative idea. For the second project, the python programming is used. User can learn basic python coding to gain the graph. In this project, the temperature from the CPU Raspberry pi graph is the output from the coding. The CPU temperature is depending for the graphic use in Raspberry Pi minicomputer. Then, the mobile application that has been build can be found at the play store via android smartphone. This mobile apps can be improving with many information for Raspberry. The example of another Raspberry Pi project can be upload on this app to make various type of project that can user learn on this app to learn more knowledge.

Acknowledgement

References

[1]   G. Halfacree, "The Official Raspberry Pi Beginner's Guide 'How to use your new computer'." Raspberry Pi Trading Ltd, Station Road, Cambridge, CB1 2JH, 2018.

[2]   G. Gunad, "Rancang Bangun Aplikasi Media Pembelajaran Mengenal Nama Hewan Dalam Dua Bahasa Berbasis Android Menggunakan Thunkable."

[3]   D. Siegle, "There's an App for That, And I Made It.", 2020

[4]   F. Salih and S.A. O. Mysoon, "Raspberry pi as a Video Server."

[5]   R. Barnes, "The Official Raspberry Pi Projects. Raspberry Pi (Trading) Ltd., Mount Pleasant House, Cambridge," CB3 0RN. T. 2015.

[6]   N. S. Yamanoor and S. Yamanoor. "High Quality, Low-Cost Education with the Raspberry Pi."

[7]   B. Balon and M. Simic, "Using Raspberry Pi Computers in Education", MIPRO, 2019.

[8]   A. Ismayani, "Cara Mudah Membuat Aplikasi Pembelajaran Berbasis Android dengan Thunkable.", 2018

[9]   D. A. Lestari, "Pengenalan Dalam Pembuatan Aplikasi Android Dengan Thunkable.", 2018