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MOBILE APPLICATION TESTING AND REPORT GENERATION USING IMAGE PROCESSING TECHNIQUE

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Abstract - *Smartphones are used by billions of people all over the world and are loaded with multiple mobile applications. Every application needs to be tested before it goes to the market. But mobile application testing is quite challenging, and there are so many aspects to keep in mind. Even the smallest functionality issue can trigger negative reviews and get mobile application deleted by the user. The main idea of this paper is to detect bugs in early stages of development before it goes to market. To overcome the challenges of mobile application testing, we have designed a real time automation testing tool that uses the latest trending technologies such as Image processing technique, Raspberry Pi and Python. The key in this testing mode is to determine the type and location of icons/objects on the screen to be matched with a set of predefined graphical elements using image processing. Image processing is done by Raspberry Pi module with the help of camera. Requirements and test cases are written using Python. A mechanical frame with robotic arm is used to navigate through mobile screen. At the end of testing, report will be generated in excel format with bug details and test cases will be marked as pass or fail based on the testing result. This result determines whether the app is ready to go the market or not.*

Key Words*: *Automation testing tool, Mobile application, Image processing, Raspberry Pi.

1. INTRODUCTION

A mobile application is a computer program which runs on a mobile device such as a phone, tablet, or watch. With the improved capabilities of smart phones and growing number of mobile applications available at app stores, people are downloading more applications to their devices. Usage of mobile applications has increased across mobile phone users. User experience and flawless functionality are most important if mobile application is to have a chance for success in today's mobile app market. This can be achieved by mobile application testing.

Mobile application testing is the process every application developed for hand held devices like smart phones or tablets has to go through. This is to assure a certain level of quality before an application is released into the app store/ play store. Applications are tested for checking their security, functionality and their usability, etc. The importance of mobile application testing is, smart phone users install new applications on the basis of ratings and reviews, which are directly related to the performance of that application. New features keep users happy and quick bug fixes make sure that nobody uninstalls the app, making testing essential for an app's survival in the market.

2. OBJECTIVE

Rapid growth in smart phone industry has increased the need to develop numerous mobile applications. These apps are developed in short span of time. Hence, some are filled with bugs and fails to function properly. Main objective of this paper is to test the mobile applications and report the bugs present in it. This is done by an automation testing tool. It tests the apps at real time.

3. PROPOSED SYSTEM

Mobile applications have gained much popularity in today's world. Most of these mobile applications tend to have bugs which may affect the user experience. So, to detect these bugs we have designed a automation testing tool. Test cases are written in excel and programs are written in python. Automation testing is made possible with the help of mechanical structure which consists of a robotic arm (this arrangement consists of electromagnetic switch with touch sensor). Raspberry pi controls the arm movement using stepper motor. Image processing is done before and after testing. Before the screen is touched, mobile screen is captured in raspberry pi using IP webcam application. Text detection is done in captured image to instruct the pointer to go and touch a particular co-ordinate (position) of the screen. After the screen is touched, again screen is captured in raspberry pi and sent to PC to generate the report. This process is repeated again and again until a particular application is tested completely. At the end of this process, the final report containing details of test cases is generated in python editor. The results show whether the test case is passed, failed or not executed. It is real time analysis.

4. BLOCK DIAGRAM

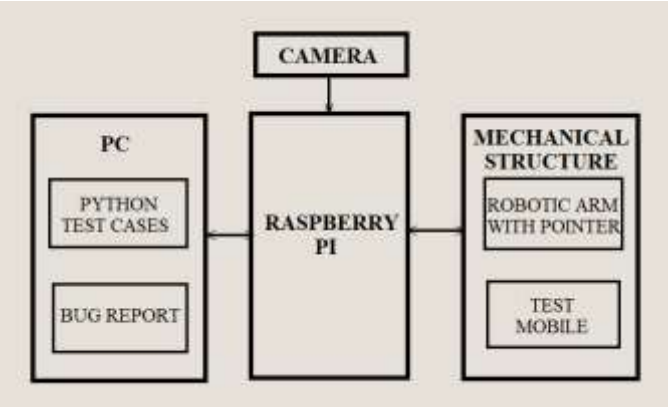

Fig -1: Block Diagram

The block diagram proposed system is shown in the Fig-1. PC is used for the purpose writing test cases and generating bug report. It sends test cases to Raspberry Pi and receives response image of the test case from Pi. Raspberry Pi module controls the camera, mechanical structure. Camera captures the images before and after testing and sends it to Pi. Mechanical structure module consists of robotic arm with stylus pointer, which touches the application screen being tested. Robotic arm moves with the help of stepper motors. Test Mobile is placed below the robotic arm.

5. HARDWARE DESCRIPTION

All the physical devices used in any system are hardware. They can be electronic devices or mechanical systems.

5.1 RASPBERRY PI

Fig 2- Raspberry Pi

Raspberry Pi is a low cost, small size single board computer. Peripherals like keyboard, mouse, display can be connected to the Raspberry Pi, it will act as a mini personal computer. Raspberry Pi is popularly used for real time Image Processing. SD card is used for storing the OS. Raspberry Pi provides access to the on-chip hardware i.e. GPIO pins for developing an application. By accessing GPIO, we can connect devices like motors, sensors, etc. The CPU speed of Pi varies from 700 MHz to 1.2 GHz. It has on-board SDRAM. It also has ARM based Broadcom Processor SOC along with on-chip GPU.

5.2 STEPPER MOTOR

Fig 3- NEMA-17 Stepper Motor

A stepper motor is also known as step motor or stepping motor. It is a brushless DC motor which divides a full rotation into a number of equal steps. The motor's position can be moved or hold at one of these steps without any position sensor for feedback, when the motor is carefully sized to the application in respect to torque and speed any position sensor and speed.

4.3 STEPPER MOTOR DRIVER

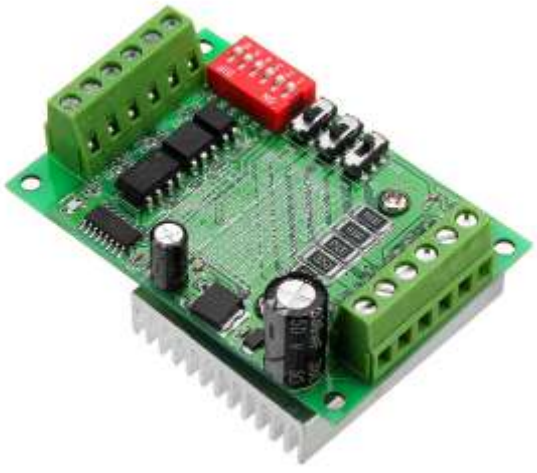

Fig 4- TB6560 Stepper Motor Driver

TB6560 Stepper motor driver is used to drive the NEMA-17 stepper motor. It is used for axis control. It has large heat sink to ensure good heat dissipation. It has operating voltage in the range of (10V-35V)DC. Rated output is ±3A. It is semi-flow mode adjustable, semi-flow current

adjustable. Recommended power supply is 24V-DC Switched Mode Power Supply.

4.4 ELECTROMAGNETIC SWITCH

Fig 5- JF-0630B DC Solenoid Electromagnet

This solenoid functions as an electromagnetic switch and can retract a pin. The spring in the solenoid pushes the pin out by default, but the pin is pulled in when the solenoid is switched on.

4.5 RELAY MODULE

Fig 6- JQC-3FF-S-Z 2-Channel Relay Module

JQC-3FF-S-Z 2-Channel Relay Module is a relay interface board. This can be controlled directly by a wide range of Micro-controllers such as Arduino, PIC, ARM, Raspberry Pi and so on. This module uses a low level triggered control signal (3.3-5V)DC to control the relay. It has normally open and normally closed mode of contacts. When the relay is triggered, it is either turned on or off depending on the mode of contacts. It is majorly used in an automatic control circuit. It acts as an automatic switch to control a high-current circuit with a low-current signal.

4.6 MECHANICAL STRUCTURE

Fig 7- Mechanical Structure

Mechanical structure is the main hardware part of the system. It resembles CNC plotter machine. Mechanical structure consists of metal rods, three stepper motors, one electro-magnetic switch. Two stepper motors are for vertical movement and one is for horizontal movement. The horizontal metal rod is fitted with electro-magnetic switch (robotic arm) which acts a touch screen pointer for test mobile. This switch is controlled by relay module. Another important module in mechanical structure is, test mobile. Test mobile plays an important role in the system. The application to be tested is installed in this mobile. The touch input is given through robotic arm arrangement. Depending on the test case, the response screen will be obtained.

4.7 SWITCHED MODE POWER SUPPLY(SMPS)

A switched-mode power supply is an electronic circuit that converts power using switching devices that are turned on and off at high frequencies, and storage components like inductors or capacitors to supply power when the switching device is in off state. In this system, SMPS 24V-5A and SMPS 12V-5A are used

5. SOFTWARE DESCRIPTION

Software is a term used to refer to applications, scripts and programs that run on a device.

5.1 PYTHON

Python is an interpreted object-oriented high-level programming language with dynamic semantics. It has high-

level built in data structures, combined with dynamic typing and dynamic binding makes it attractive for Rapid Application Development. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

5.2 OPENCV

Computer Vision is a field of deep learning. It enables machines to see, identify and process images. OpenCV (Open Source Computer Vision Library) is a machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products.

5.3 TESSERACT

Python-tesseract is an optical character recognition (OCR) tool used for python. This will recognize and read the text embedded in images. It can read all image types supported by the Pillow and Leptonica libraries, including jpeg, png, gif, bmp, tiff, and others. Additionally, if it is used as a script, Python-tesseract will print the recognized text instead of writing it to a file.

5.3 IP WEBCAM MOBILE APPLICATION

IP Webcam is an app that allows you to convert your Android phone into an internet camera. It has multiple view options like viewing in VLC player or internet browser. It allows you to convert your Android phone into a video surveillance tool.

6. RESULTS

6.2 SOFTWARE OUTPUT

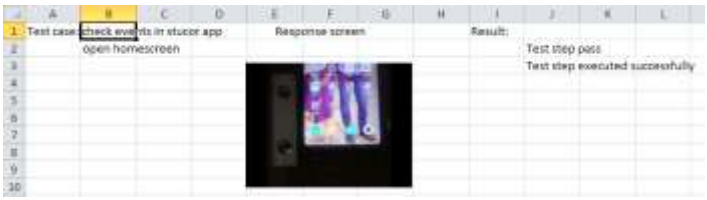

Fig 8- Output Bug report

6.3 HARDWARE

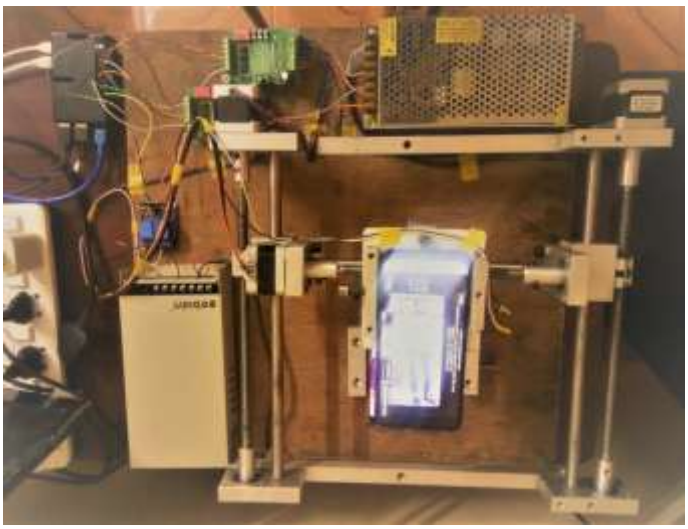

Fig 7- Hardware

7. CONCLUSION

The proposed technique presents a complete framework to automate the testing process. This technique is applied to mobile applications and the results shown are effective in terms of finding bugs in applications. The main advantage of this system is its higher efficiency at low cost. The system efficiency is much higher than manual testing. This is a low cost test automation tool when compared to other real time testing tools.

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