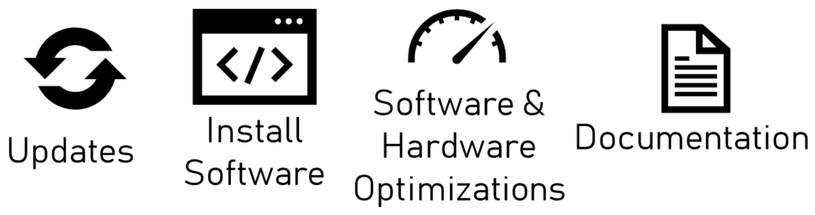
Abstract

Computer repair technicians spend significant time conducting repetitive software computer maintenance tasks. Maintenance tasks technicians conduct include applying available updates, installing software, optimizing hardware and software, and creating a documentation report. A script can be developed to automate repetitive software maintenance tasks. This study uses the engineering and design process to develop and test an automation script on a Raspberry Pi Zero 2 W to automate computer maintenance. I configured the Raspberry Pi Zero 2 W to emulate mouse and keyboard outputs through its micro-USB ports and to accept screen input from a Windows computer using an HDMI to CSI adapter. Using Microsoft Visual Studio Code, I developed a data-oriented script in Python that is installed on the Raspberry Pi. I tested the automated Raspberry Pi device on eight Windows 10 and 11 computers. The device had an average computer maintenance duration of 38 minutes and 13.5 seconds, with an accuracy of 85%. The automated maintenance script significantly reduced the time computer technicians spend performing maintenance in their eight-hour workday by 15.93% when performed on at least two computers. In conclusion, implementing this study's automated Raspberry Pi can help streamline computer technicians' workflow, increase workplace productivity, and save the resources needed for computer maintenance. I recommend future studies to test automated maintenance scripts using different devices on other types of computers.

Computer Technicians

- Identify, Troubleshoot, and Repair Computers (Bika, 2022)
- Conduct Computer Maintenance (Bika, 2022; Pourhadi, 2019)
- Computer maintenance contains many repetitive tasks that can be automated with scripts (Hanna et al., 2014; Pourhadi, 2019)



Automation Scripts

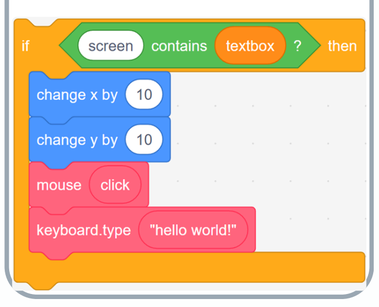
- Automation Scripts can be used to automate repetitive computer maintenance tasks (Al-Bataineh et al., 2021; Hanna et al., 2014; Pourhadi)
- Scripts must be maintained when a system's interface or functionality changes (Hanna et al., 2014)
- There are many scripting techniques that have various benefits and cost to develop (Hanna et al., 2014).

Linear Scripting

This scripting technique contains a list of actions for a computer to perform (Hanna et al., 2014)

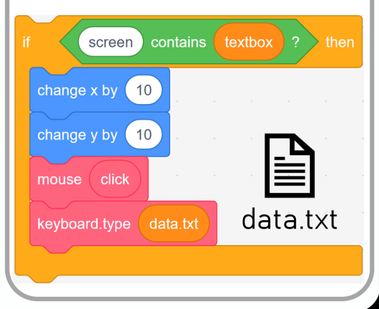
Structured Scripting

This scripting technique adds conditionals to linear scripts to add intelligence and complexity to scripts (Hanna et al., 2014)



Data-Oriented Scripting

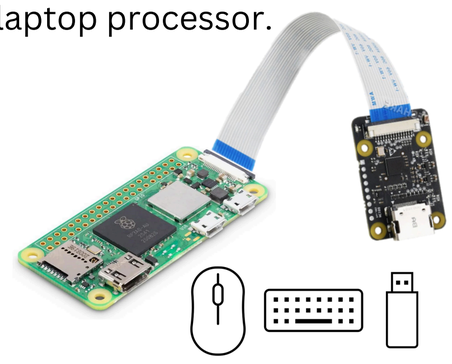
This scripting technique uses external data as input for a structured script (Hanna et al., 2014)



Design Process

Configuring the Raspberry Pi

- Configured to emulate mouse, keyboard, and USB mass storage device from configfs.txt file.
- Attached HDMI-CSI adapter to receive screen input from Windows Computers.
- Has a processor that is 10 times slower than a Windows laptop processor.



Developing the Script

- Created Python script using Microsoft Visual Studio Code.
- Tracked script changes using GitHub Repository (Twyman, 2024).
- Used the data-driven scripting technique (Twyman, 2024).

Maintenance Tasks:

- Installs Latest Windows Updates
- Installs Software (Anti-Virus)
- Clears Temporary Files (Recycle Bin and Temporary Internet Files
- Defragments HDD and Trims SSD
- Saves Documentation

```
231  with Keyboard() as k, Mouse() as rel_mouse:
232      timer1 = perf_counter()
233      rel_mouse.move(1,0)
234      rel_mouse.move(-1,0)
235
236      # Command 1
237      Connect_Display()
```

Snapshot of the automation script's mouse funciton in Visual Studio Code

Analysis

The automated Raspberry Pi Zero 2 W conducted computer maintenance in an average of 38 minutes and 13.5 seconds, with a standard deviation of 20.2.

Saves computer technicians significant time per eight-hour workday for each conducted computer maintenance:

- 7.96% time for one computer (~38 mins)
- 15.93% time for two computers (~1hr 16mins)

Executed Maintenance Tasks with an 85% Accuracy

- 34 Completed Tasks; 6 Incomplete Tasks

The task that had the highest completion rate were disk defragmentation and temporary file removal. These tasks were completed by running specialized Windows programs. The task with the lowest completion rate was software installation. The Raspberry Pi's emulated USB storage device was assigned a disk letter that the script had trouble determining.

Conclusions

- Computer technicians can save significant time and resources on computer maintenance using this study's automation script
- Streamlines Computer Maintenance
- Increases workplace productivity since computer technicians can spend more time on tasks that require more cognitive and physical load.
- The device met two out of the three constraints leaving room for more opportunities for future studies to develop this device further.

Acknowledgements

I want to thank those who helped guide me during this project. This project would not have been possible without them.

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Recommendations

Future studies on developing computer maintenance scripts can

- Test faster tools that can handle more complex automation scripts
- Add more conditionals to scripts to improve accuracy and complexity
- Expand the population of computers past Windows 10 and 11 computers
- Implement more maintenance tasks for the script to conduct

References

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