OFFLINE VOICE RECOGNITION MODULE USING RASPBERRY PI

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ABSTRACT

A growing number of smart devices are getting connected to the Internet and that poses a privacy threat. An offline voice recognition system could minimize or eliminate such privacy concerns by boosting security. Voice recognition is a software solution that turns spoken language into text that can be recognized by computers. The Raspberry Pi has voice recognition functional capabilities to convert voice into text. The text can be transmitted using the serial communication protocol to a micro-controller. Our goal is to build a voice recognition module that will be used within a more complex system. For example, if a smart car needs voice recognition system, we can connect this module with three wires only to achieve the car's voice recognition capability. We are going to use Rhasspy (an Open-Source fully offline voice assistant toolkit that works well with Home Assistant), Hass.io (an OS that take cares of installing and updating Home Assistant), and Node-RED (a programming tool for wiring together hardware devices).

INTRODUCTION

- The offline voice recognition module using raspberry pi is a python project developed on and for Raspberry pi.
- The goal is to provide offline and real-time audio processing and then transmit processed data via Raspberry Pi serial port.
- To demonstrate the usefulness of the module, we will use an Arduino which will interpret the serial data.

RASPBERRY PI AND ARDUINO

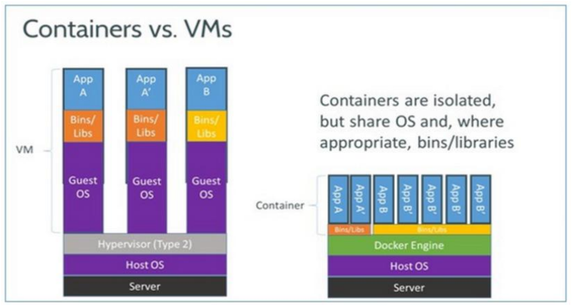
- Raspberry Pi is a device that is low in cost, a small computer that puts the power of computing into any and every person's hands who are willing to explore.[1]
- Once Raspberry Pi processes human voice, it can save data in a database. Then based on that information, Raspberry Pi can transmit data via its serial port.
- Microcontrollers such as Arduino can read this serial data as commands and perform actions.

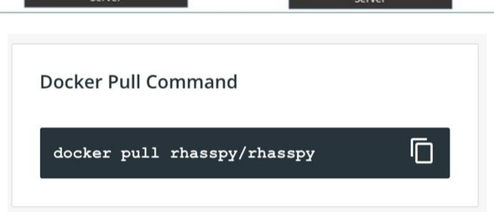
VOICE RECOGNITION AND RHASSPY

- Voice recognition is the process of taking a spoken word as an input that is recognized by computers and turning it into text.
- An offline voice recognition software solution such as Rhasspy, minimizes or eliminates privacy concerns and boosts security.

VNC AND DOCKER

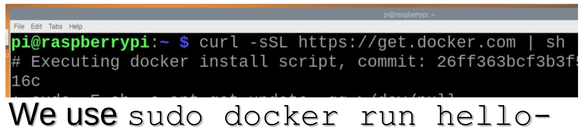
- Virtual Network Computing (VNC) is a graphical desktop-sharing system that allows us to remotely control another computer over a network.[2] We can transmit keyboard and mouse events from one computer to another.
- Docker enables developers to easily pack, ship, and run any application as a lightweight, portable, self-sufficient container, which can run virtually anywhere.[3]
- Docker is the easiest solutions for virtualization, as of today there are 4,133,548 images available.





RESULTS

- We navigate the Raspberry Pi UI from the RealVNC viewer.
- We use the curl command to install Docker.



- We use `sudo docker run hello-world` and `docker pull rhasspy/rhasspy` to get the hello world and the Rhasspy images.
- With the `docker images` command we can check pulled images from Docker.

FUTURE WORK

- We will test the voice recognition capabilities of Rhasspy.
- We will integrate both Raspberry Pi and Arduino so that Arduino can receive serial commands from the Raspberry Pi.

CONCLUSION

- In this project we have introduced ourselves with the industry standard Docker ecosystem.
- The module can be used offline if strings of text are preloaded in the database and the Arduino is programmed accordingly.
- This project has enough potential to add offline voice recognition systems to any existing project with little coding and by only connecting three wires: SCL, SDA, and common ground.

REFERENCES

[1] Heath, Nick. "What Is the Raspberry Pi 4? Everything You Need to Know about the Tiny, Low-Cost Computer." ZDNet, ZDNet, 2 July 2019, www.zdnet.com/article/what-is-the-raspberry-pi-4-everything-you-need-to-know-about-the-tiny-low-cost-computer/.
[2] "Virtual Network Computing." Wikipedia, Wikimedia Foundation, 12 Oct. 2020, en.wikipedia.org/wiki/Virtual_Network_Computing.
[3] Vaughan-Nichols, Steven J. "What Is Docker and Why Is It so Darn Popular?" ZDNet, ZDNet, 21 Mar. 2018, www.zdnet.com/article/what-is-docker-and-why-is-it-so-darn-popular/.