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# Assistant Suite

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ELECTRICAL & COMPUTER ENGINEERING

CAPSTONE DESIGN EXPO 2017

# Assistant Suite

ECE 412 | **Team members:** Dale Greene, John Pham, Ritvik Nag | **Faculty adviser:** Dr. Michael Cabral

## Background

### Objective

Produce an application that successfully demonstrates software-to-hardware implementation with the following points in mind:

- Providing a convenience for the user by providing a hands-free application
- Utilizing voice-to-mechanical implementation across multiple platforms within one application
- Advancing research in the direction of hands-free technology

**Hardware used:**

- Amazon Echo Dot
- Raspberry Pi
- RC Car Chassis Kit

**Software used:**

- Amazon Web Services (AWS)
- Alexa Skills Kit (ASK)
- Alexa Voice Service (AVS)

### Future Goals

- Improve latency of voice command to mechanical movement
- Integrate a larger number of devices & microcontrollers into the application for increased versatility
- Add additional types of hardware to demonstrate versatility
- Allow AWS to communicate with multiple microcontrollers at once
- Test application on voice service platforms other than Amazon
- Test application with microcontrollers other than Raspberry Pi

## High-Level Implementation Overview

### Phase One: User speaks into Echo

Alexa is always listening and running against the Alexa Voice Service (AVS), which is a service embedded within the Alexa Developer portal, as long as there is a good internet connection since it is cloud-based. Once the "wake" word is spoken, Alexa at that point records what is said until the expected speech timeout is reached; the recording is then stored in AVS as a multipart message, consisting of a JSON-formatted object and a binary audio captured by the microphone.

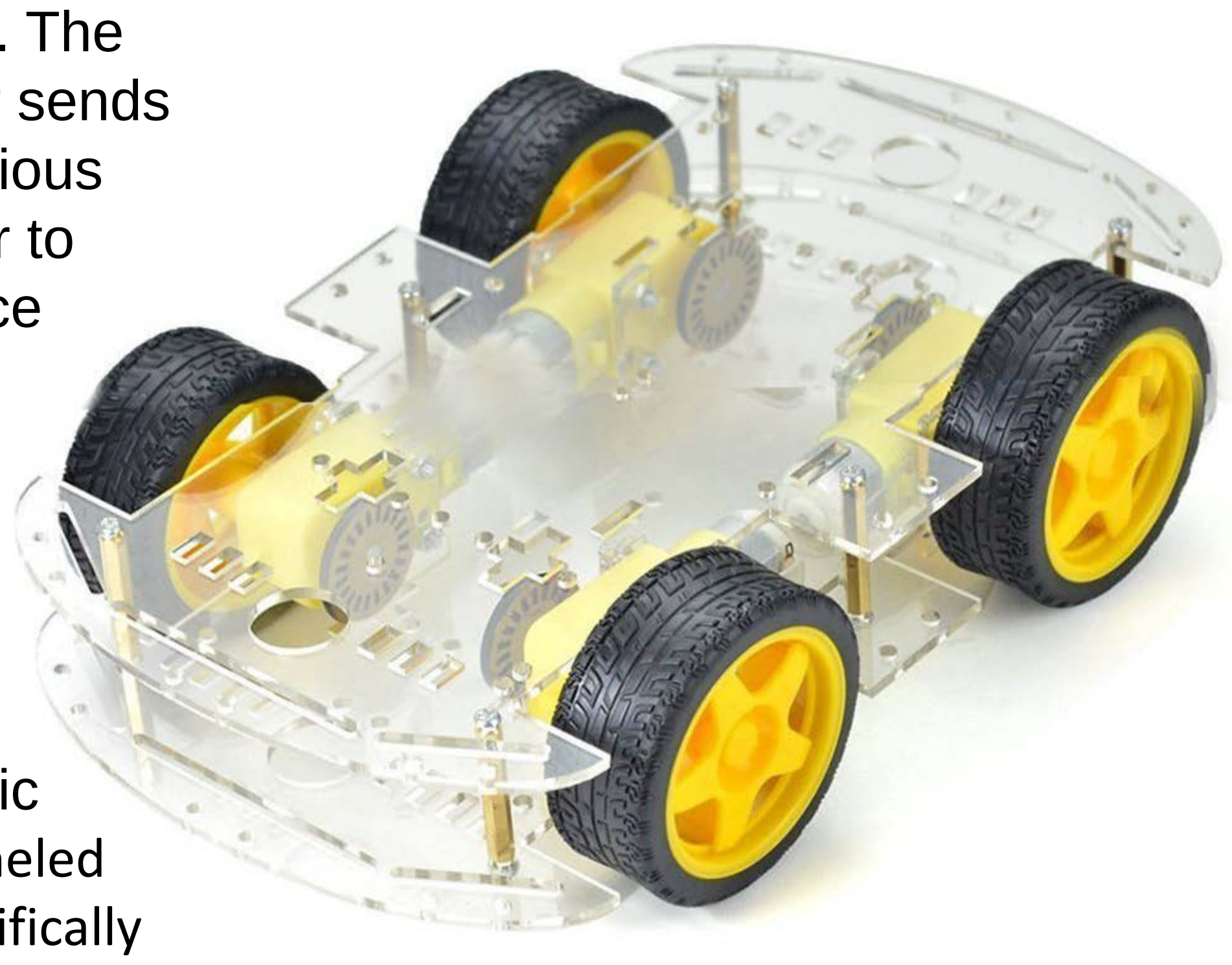
The Echo utilizes a Wi-Fi connection to send recorded voice files to AWS

### Phase Two: Echo communicates with AWS

Once a new recording is stored, AVS then interacts with Alexa Skills Kit (ASK) to listen out for utterances that are manually stored in the developer portal. The results of whether or not a match to an utterance was found is sent to a linked lambda function whether or not a match to an utterance was found is sent to a linked lambda function hosted within the Lambda service of the Amazon Web Services (AWS) platform. The Lambda service then runs segments of code based on what utterances were collected (if any), and it sends signals to one of several Raspberry Pi microcontrollers. This is done by sending an email with specific subjects to trigger segments of code that are embedded within the microcontrollers.

AWS then communicates with the Raspberry Pi, also via Wi-Fi

### Phase Three: AWS communicates with Raspberry Pi



There is one Raspberry Pi microcontroller connected to each individual device. All of the microcontrollers continuously check for new emails that arrive in a dedicated email account. The email sent from the lambda function determines which microcontroller is contacted and what segments of code are run within that microcontroller. The code that resides on each microcontroller is what drives the mechanical movements of each device. The microcontroller sends voltages to various motors in order to make the device move as Instructed. All in all, the user specifies which device to control, and that specific device is channeled and moves specifically as instructed as the end result.

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