

# wake word

## FORGET "HEY SIRI"

### Context

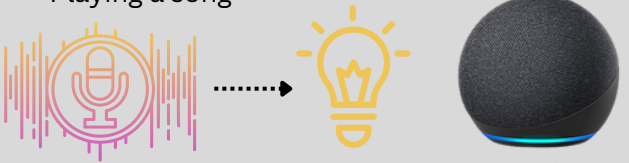
#### Aim :

Implement the Offline Speech Recognition technique in Teensy 4.0 as a smart home device

- Improve the quality of daily life.

**Wake word detected :** Wait for commands to run programs for different functions

- Switch on the LED
- Playing a song



Amazon Echo Dot 5

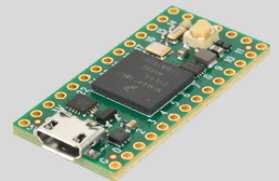
### Proposition

#### Implementation :

- **Speech Recognition** : Frequency Detection
  - Study the frequencies for wake word and different commands
- **Adjust frequency range** : Assure the stability and response rate
- **Configure the functions** : Switch on LED on Teensy 4.0

#### Hardware :

- Teensy 4.0
- Teensy Audio Shield
- Headset with microphone

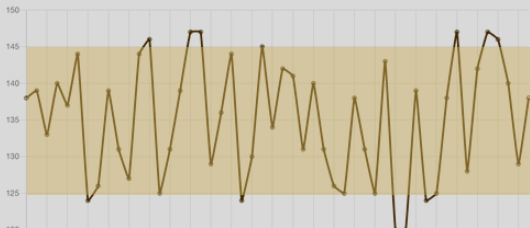


Teensy 4.0

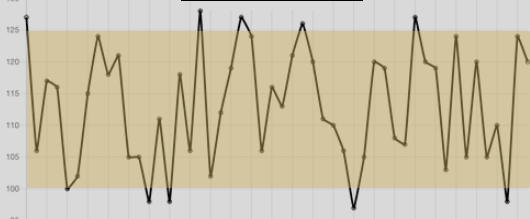
### Results

#### Wake Word : Hallo

##### "Ha" Pitch Variation



##### "llo" Pitch Variation



#### Frequency range :

- "Ha" : >125 Hz & <145 Hz
- "llo" : >100 Hz & <125 Hz

#### Wake Word detected success rate : 90 %

Same application for the **commands detection**

#### Source of errors :

- Accent
- Noise interference
- Emotion
- Health conditions

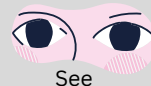
#### Frequency detection Speech Recognition

##### • Benefits

1. Flexibility : Different languages and dialects
2. Speed : Real-time processing
3. Accuracy : Reliable and efficient

##### • Disadvantages

1. Limited vocabulary : Complex words and phrases
2. Speaker dependence : Age & Gender
3. Limited context understanding : Homophones

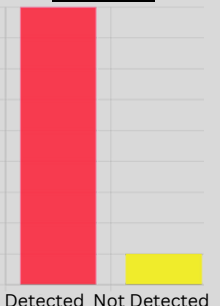


See



Sea

#### Wake Word detected success rate



### Perspective and conclusion

#### Microcontrollers :

Perfect domestic IoT device

- ultra power-efficiency
- no external RAM

#### Frequency detection :

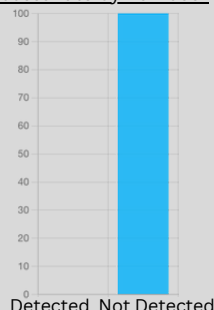
High dependency on the user

- Customisation
- Security

#### Extension :

- Controller for every home appliances

#### Wake Word detected success rate by non-user



### Reference

- [1] P. Setiawan and R. Yusuf. "IoT Device Control with Offline Automatic Speech Recognition on Edge Device". In: 12th (ICSET). Oct. 2022
- [2] Fan-Gang Zeng et al. "Speech recognition with amplitude and frequency modulations" In: PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES Vol. 102 | No. 7. 15 Feb. 2005



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