Project in Artificial Intelligence

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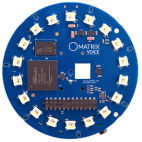
Content

The Problem

- Trashcan robot
- Smart learning robot
  - Online learning navigation
  - Sound to roughly localize human
  - Camera to localize obstacle

Equipment

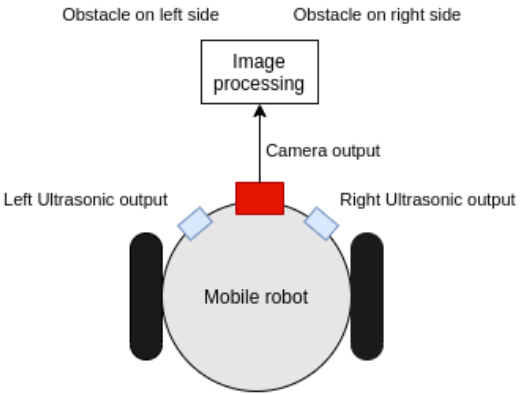
- Raspberry Pi 4
- Matrix voice
- Raspberry Pi Camera
- Ultra Sonic Sensors
- Differential drive
- Battery



2x

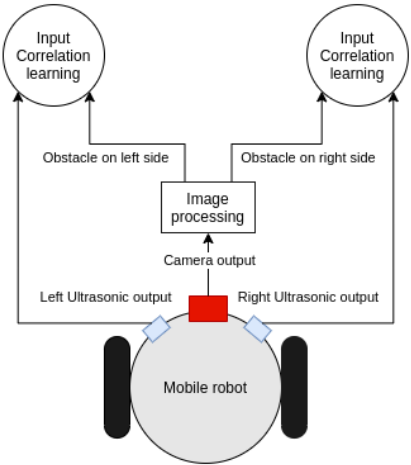
Online Learning

The Robot



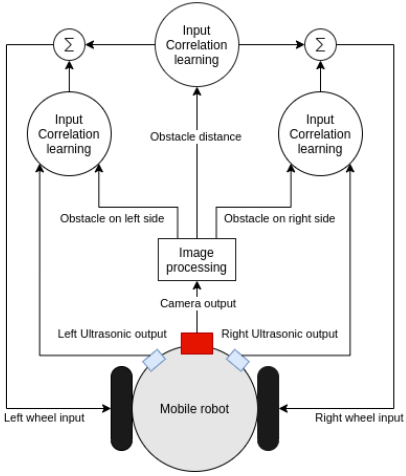
Online Learning

Adaptive Neural Circuit



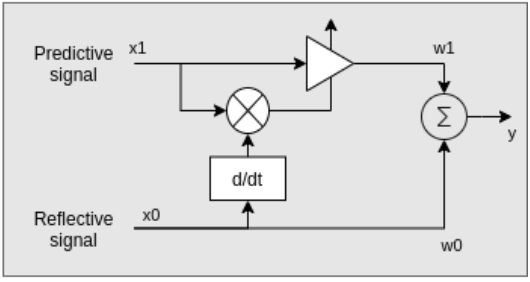
Online Learning

Adaptive Neural Circuit



Online Learning

Input Correlation Learning



$$y = w_0 \cdot x_0 + w_1 \cdot x_1$$

$$\frac{d}{dt}(w_1) = \mu \cdot x_1 \cdot \frac{d}{dt}(x_0)$$

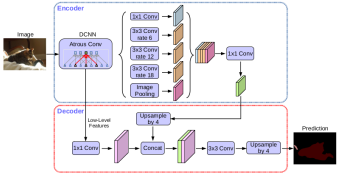
Semantic Image Segmentation

- Used as predictive signal
  - Obstacle avoidance
  - Human following
- Deep learning
  - DeepLabV3+
  - TensorFlow ⇒ TensorFlowLite
  - Coral USB accelerator

Coral USB accelerator

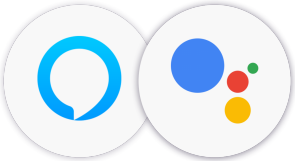
Semantic Segmentation

DeepLabV3+ Architecture

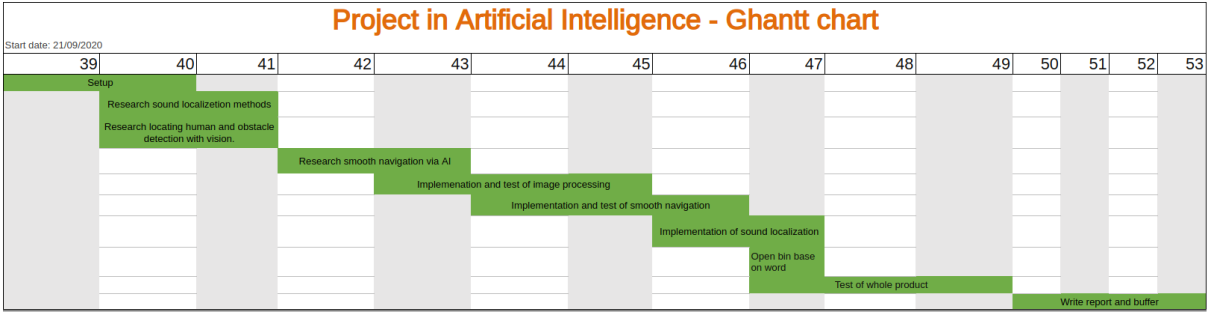


Sound Localization

- Google assistance or Alexa
- Sound array localization



How is it going then?



Questions

Any questions?

References

Trashcan robot https://i.ytimg.com/vi/PL_4217NjHo/maxresdefault.jpg
Raspberry Pi: shorturl.at/cgiK5
Raspberry Pi Camera: shorturl.at/sEPWY
Matrix voice: https://www.matrix.one/products/voice
Ultrasonic sensor: shorturl.at/inxDM
DeepLabV3+ Architecture:
https://openaccess.thecvf.com/content_ECCV_2018/papers/Liang-Chieh_Chen_Encoder-Decoder_with_Atrous_ECCV_2018_paper.pdf
Coral USB accelerator: https://bit.ly/2IxoKzx
Google-Alexa: https://clickup.com/blog/wp-content/uploads/2018/03/alexa-google-1400x875.png