AUTONOMY RESEARCH CENTER FOR STEAHM

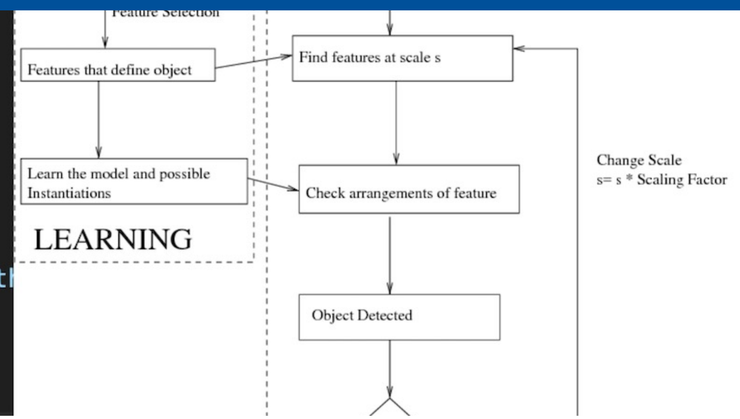
Human-Machine Teamwork with Explainable AI

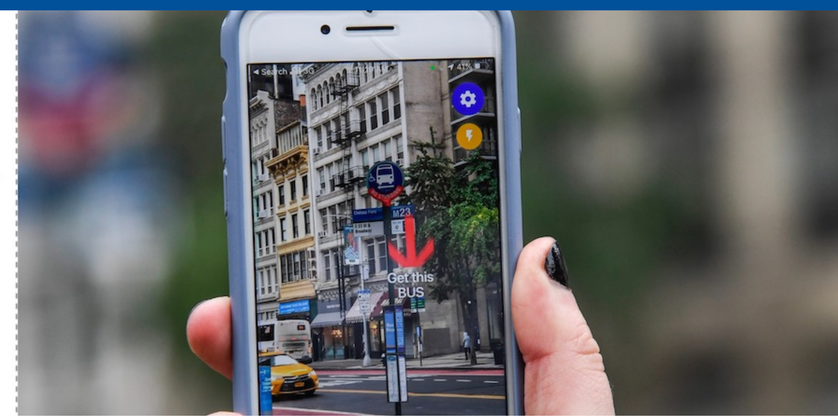
Object Recognition and Interpretation for Visually Impaired Assistance

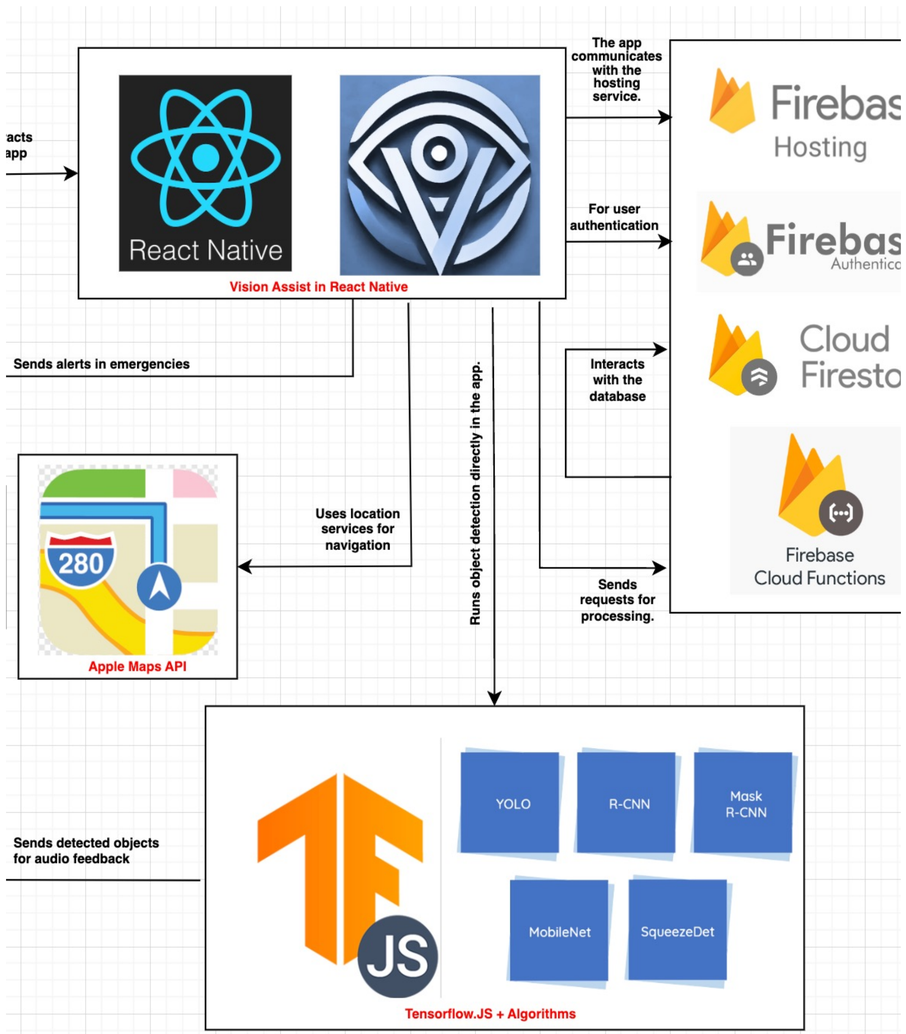
```
cords = box.xyxy[0].tolist()
cords = [round(x) for x in cords]
x, y, w, h = cords
class_id = result.names[box.cls[0].item()]

# Calculate distance for the detected object
object_width_in_frame = w
object_distance = Distance_finder(Focal_length_found, Known_width
object_distance = round(object_distance, 2)

# Generate description and speech for the detected object
```







Synopsis

- This research focuses on designing and implementing the Vision Assist mobile app to help visually impaired people by recognizing objects and reading text aloud.
- It uses a phone's camera and machine learning to give real-time voice feedback for easier navigation of surroundings.
- The app also includes GPS directions and an emergency alarm for added safety.

Research Objective

- Develop an assistive technology solution that improves the independence of visually impaired users through object detection and text interpretation.
- Enhance real-time environment awareness using a smartphone's camera and machine learning algorithms.
- Implement a user-friendly, accessible interface that provides clear voice feedback for navigation and object recognition.

Research Approach

- Conducted interviews with visually impaired individuals to learn about their daily navigation challenges.
- Used the YOLO machine learning model to accurately identify objects in the environment.
- Employed Google Cloud API to convert text into clear speech for users.
- Integrated GPS navigation with Apple Maps to provide real-time voice directions.
- Added an emergency alarm feature that connects users to their emergency contacts using Twilio.

Research Results and Products

- Developed a functional prototype that effectively identifies objects and reads text.
- Integrated voice-guided GPS navigation for enhanced user independence.
- Implemented an emergency alarm feature to ensure user safety.

Commercialization and/or Societal Impact Opportunities

Application: Launch the app as a vital tool for visually impaired individuals.

Key Value: Increases independence and enhances safety in everyday situations.

Potential Users: Visually impaired individuals, organizations focused on accessibility

Team Names & Collaborators

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Citations

Hong, K., He, W., Tang, H., Zhang, X., Li, Q., & Zhou, B. (2024). SPVINet: A lightweight multitask learning network for assisting visually impaired people in multiscene perception. IEEE Internet of Things Journal, 11(11), 20706–20717.

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Mehta, A. S., Singh, A., Pankaj, & Sagar, A. K. (2024). Vision assist glasses for visually impaired people. In Proceedings of the 2nd International Conference on Networking and Communications (ICNWC) (pp. 1–5). Chennai, India.

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