Team 2 – [Neural Bots]

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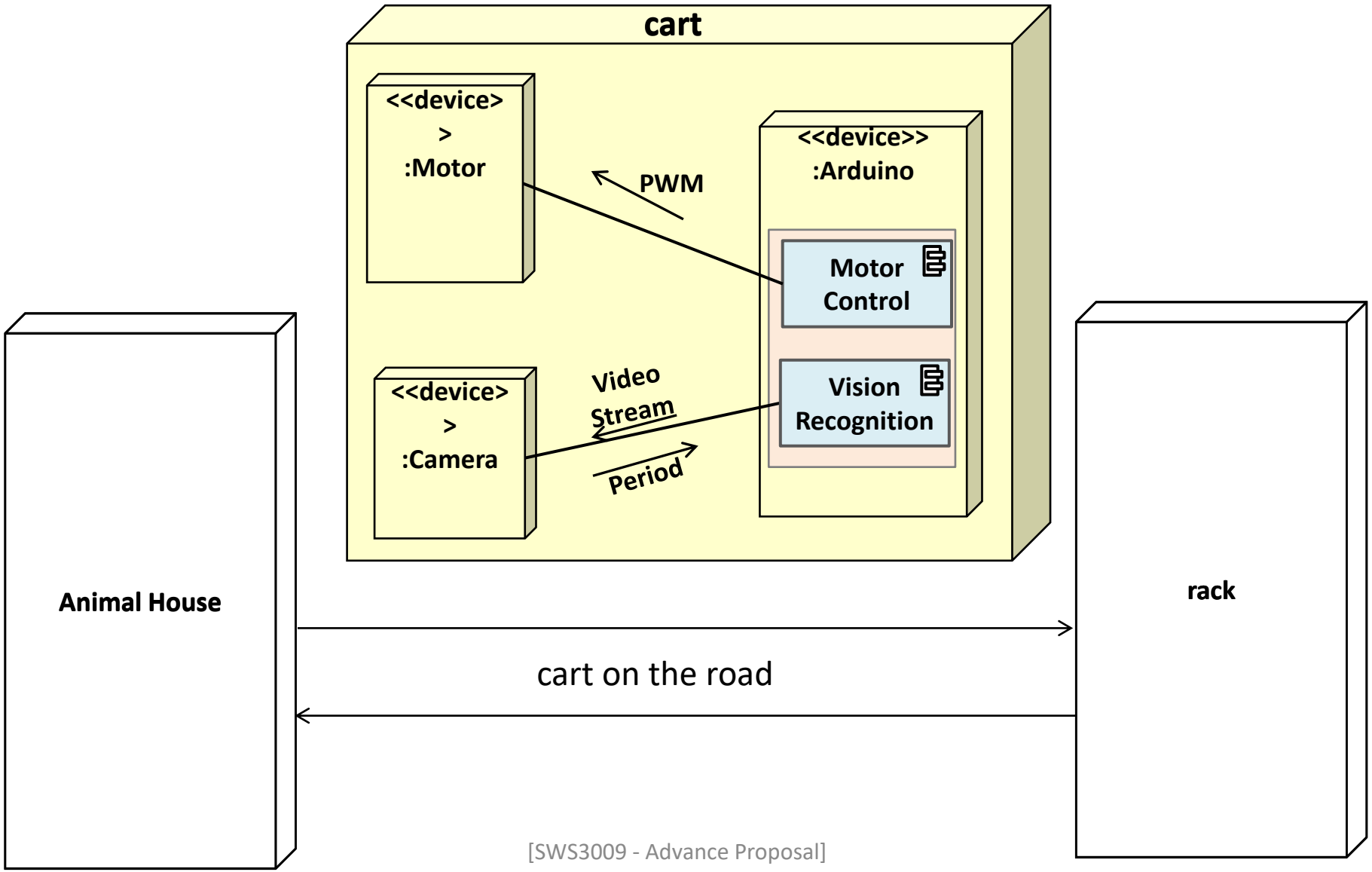
Advance Model: Overview

- Our project involves the development of a smart delivery cart designed to transport items between two locations. One side of the road is designated for fruits, where apples, bananas, oranges, watermelons, and grapes are stored on a rack. The other side is designated for animals, which include a cat, dog, deer, frog, and bird.
- At the fruit side, the cart identify and pick the specified type of fruit from the rack. Once the fruit is selected, the cart autonomously navigates to the animal side to locate the corresponding animal based on the order requirements.

Advance Model: Overview



Deep Learning: Key Info

- Data Type:
- The data consists of images that include both fruits and animals. The fruit images will be used to train the model to recognize different types of fruits such as apples, bananas, oranges, watermelons, and grapes. Animal images will be used to identify animals like cats, dogs, deer, frogs, and birds.

- Deep Learning Model:
- We utilize Convolutional Neural Networks (CNNs) for image recognition tasks. The YOLO algorithm is employed to detect and crop images. YOLO is chosen for its ability to perform real-time object detection, making it ideal for our needs in identifying and locating objects quickly and accurately.

Deep Learning: Key Info

- Input Preprocessing:
- Images are resized to a uniform dimension to ensure consistency in the input data. Pixel values are normalized to a specific range (typically [0, 1] or [-1, 1]) to standardize the input and improve model performance. Data augmentation techniques such as rotation, flipping, cropping, and color adjustments are applied to enhance the diversity of the training dataset, which helps in making the model more robust and generalizable.

- Output from the Deep Learning Model:
- The model outputs the type of object currently recognized in the image. If the image is of a fruit, it will output the specific type of fruit detected. Similarly, for animals, it will identify the specific animal.

Deep Learning: Key Info

- Post-processing of the Output:
- Based on the identified type of fruit, the system will then determine which animal the fruit needs to be delivered to. This matching process ensures that the correct item is delivered to the correct recipient.

Robotics: Key Info

- Give more information about the robotics aspect of your advance model, e.g. is it a car? Or something else? what kind of sensors / components? What actuation will you perform? Is it autonomous? Or teleoperated? What's the communication method?

Robotics: Key Info

- Type of Robot:
- The robot is an autonomous delivery cart designed to transport items from one location to another without human intervention.

- Sensors/Components:
- Cameras: Used for visual perception to capture images needed for object detection and recognition tasks.
- Ultrasonic Sensors: Used for close-range object detection, similar to parking assistance systems, to avoid collisions and ensure safe navigation.
- Computing Unit: An onboard computer (such as an NVIDIA Jetson) processes sensor data and runs the necessary algorithms for perception and control.
- IMU (Inertial Measurement Unit): Measures acceleration and angular velocity, aiding in navigation and maintaining the orientation of the cart.

Robotics: Key Info

- Actuation:
- Electric Motors: Drive the wheels to provide forward and backward movement.
- Steering Mechanism: Controls the direction of the cart, allowing it to navigate through different paths.
- Braking System: Stops the cart when necessary.
- Suspension System: Ensures smooth movement over uneven surfaces by adjusting the suspension in real-time.
- Item Grabbing System: Mechanically designed to pick up fruits from the shelf and place them onto the cart for delivery.

- Communication Method:
- The cart communicates with the remote control center or operator via Wi-Fi. This ensures real-time data exchange and monitoring, allowing for remote supervision and control if needed.

Robotics: Key Info

- Control:
- The cart is equipped with algorithms for autonomous control, including navigation, object detection and path planning. These algorithms enable the cart to operate independently, moving from point A to point B, avoiding obstacles, and performing the required delivery tasks without human intervention. Autonomous control is achieved through a combination of sensor data processing and real-time decision-making.