SACRAMENTO STATE
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

Deliveries R Us

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Problem Statement

Deliveries R Us is an autonomous door-to-door delivery robot that delivers packages to faculty members in-order to reduce delivery labor, costs, and, improve mail delivery time. We plan to do this by building a 4-wheel robot that drives down the hall and detects office numbers from QR codes placed on the door. The robot should know where each room is at and be able to arrive at its destination in an autonomous fashion. After the robot reaches the correct room, the user can input their keypad code to unlock the package crate on top. After the package is recieved, the robot will travel back to their home base docking station and charge the battery.

We will use 2 DC motors to drive the robot down the halls. It will also have have ultrasonic sensors to avoid obstacles and reorient itself at every door number. We will use two cameras in order to detect the QR codes from both sides of the hall. Then the camera will detect the code and convert it into a number on which the robot will know if its the correct room and move accordingly to that number. The kinect will then be able to move the robot back to its home base where it can charge itself.

Functions

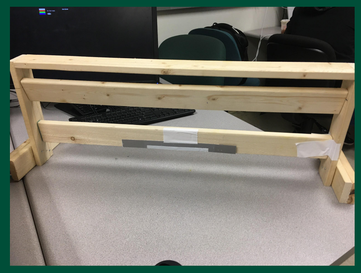
The Deliveries R Us robot will feature Ubuntu OS QR Code Recognition, and 2D mapping. Additional features include ultrasonic sensor based object detection, autonomous movement, and home base return.

Background

If you work in a school or office setting you may get packages delivered to a main office, then have to wait for someone to deliver it to you or go to the main office yourself. Deliveries R Us aims to improve the efficiency of mail systems, in office and dorm environments.

Design

- **The design will include a base mounted on top of 2 DC motor wheels powered up with two 12V batteries.**
- **Ultrasonic range sensors will be attached to the base in order to detect and avoid obstacles while in motion. It is also used to aid docking into a home base charger.**
- **Two web-cameras will be placed on top of the package crate to detect the QR codes (respective to room numbers). An XBOX Kinect will also be placed on top to aid with 2D mapping.**
- **The package crate will have a lock that can be opened by inputting the correct code in the keypad attached.**
- **In addition, an Ubuntu OS will be programmed to detect and recognize different QR codes that will be placed around the room doors in order for the camera to recognize and tell the robot to stop at the designated room number.**



Impact on Community

This project intends to reduce delivery labor and costs as well as improve mail delivery time in office and school environments. This project also serves as a step in fully automating our mail delivery systems. In addition, the students involved developed skills in Visual Learning, 2D Mapping algorithms, object detection and avoidance, and hardware serial communication.