



DELAY TOLERANT NETWORK FOR AUTONOMOUS ROBOTIC VEHICLE CHARGING

Senior Design Project 2014

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THE PURPOSE

To create a Delay Tolerant Network (DTN) and a set of robots that can autonomously find a charging station.

THE PROBLEM

In remote areas, modern communication networks can be ineffective, and vehicles need a distributed and reliable method of sharing data.

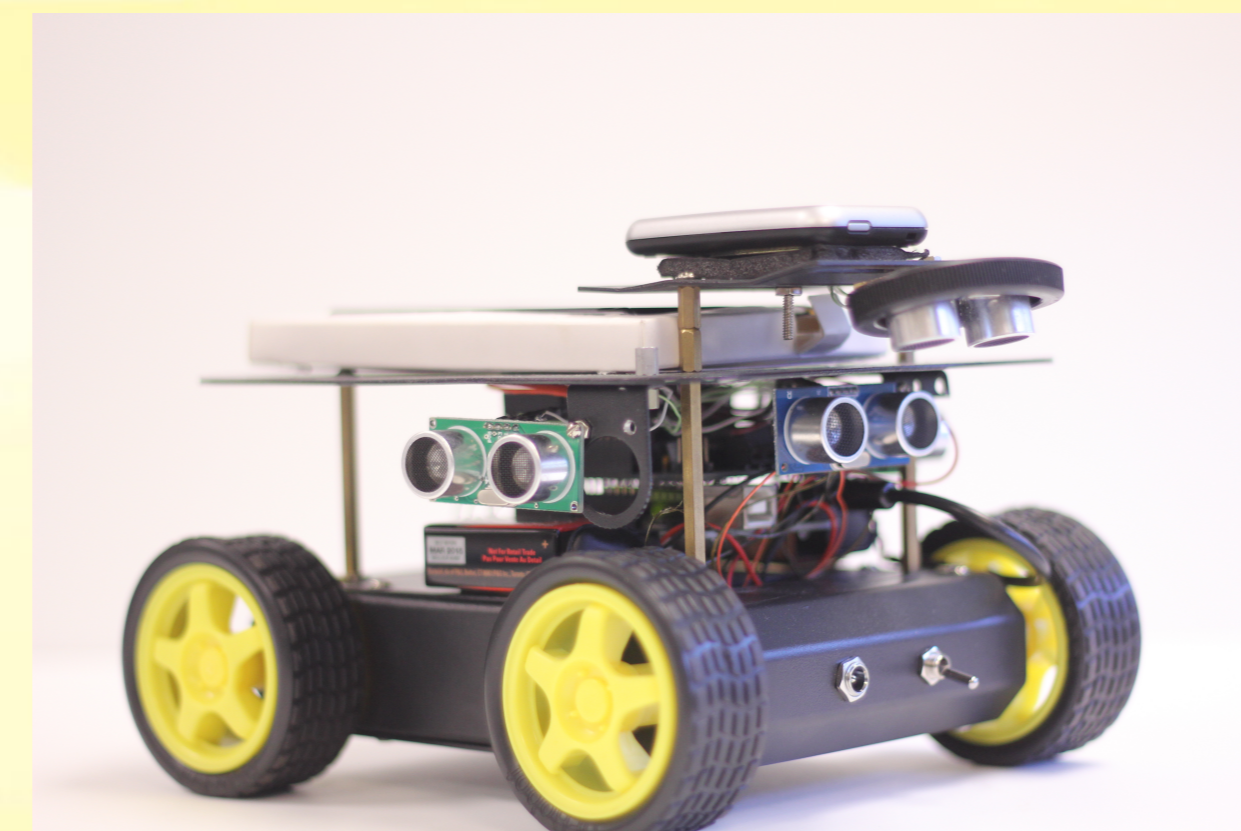
HOW NAVIGATION WORKS

- Ultrasonic sensors for obstacle detection
- Arduino for controlling ultrasonic sensors and drive motors
- GPS receiver for navigation data
- Android app to calculate the optimal path

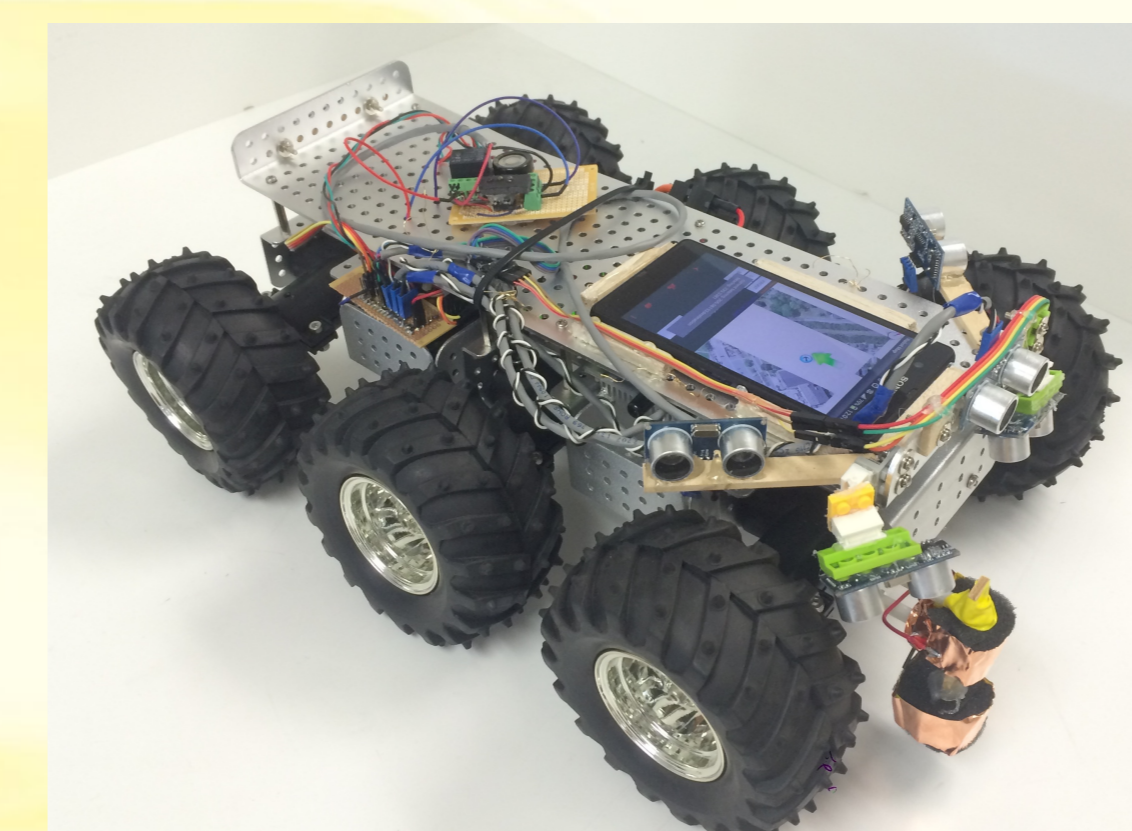
HOW COMMUNICATIONS WORK

- Bots communicate with each other and charging stations over DTN, using XBee wireless radios to share data.
- Bots collect charging station information when in range, store and share it with other bots encountered.

THE BOTS

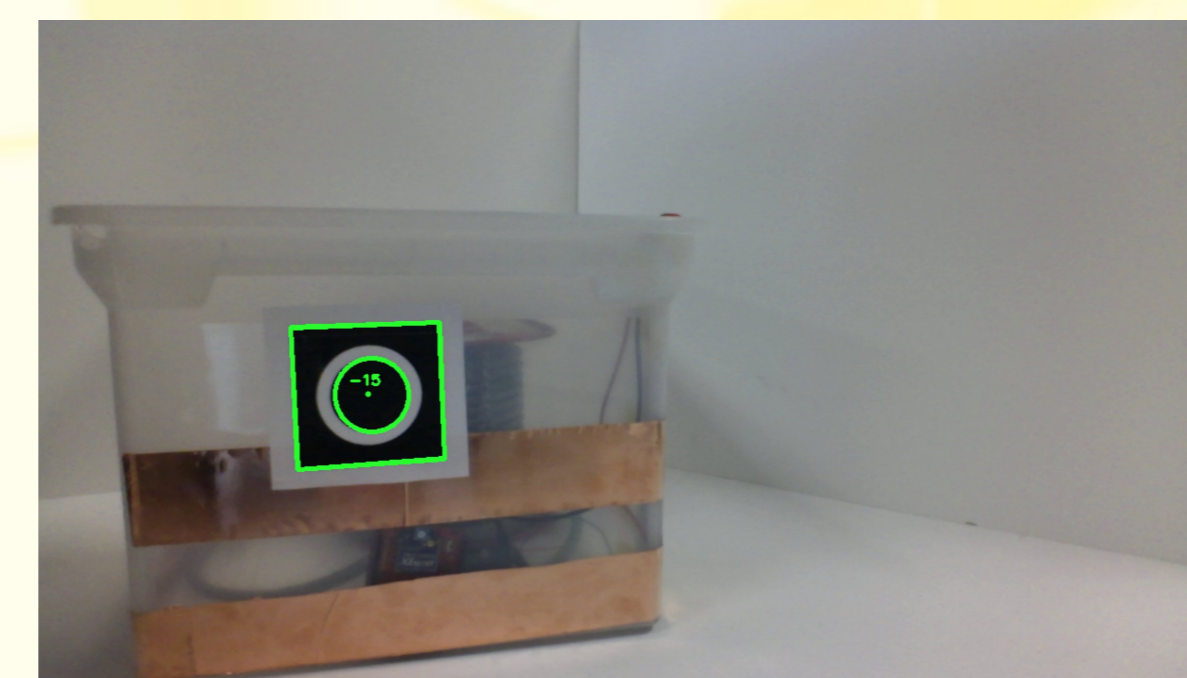


The first bot

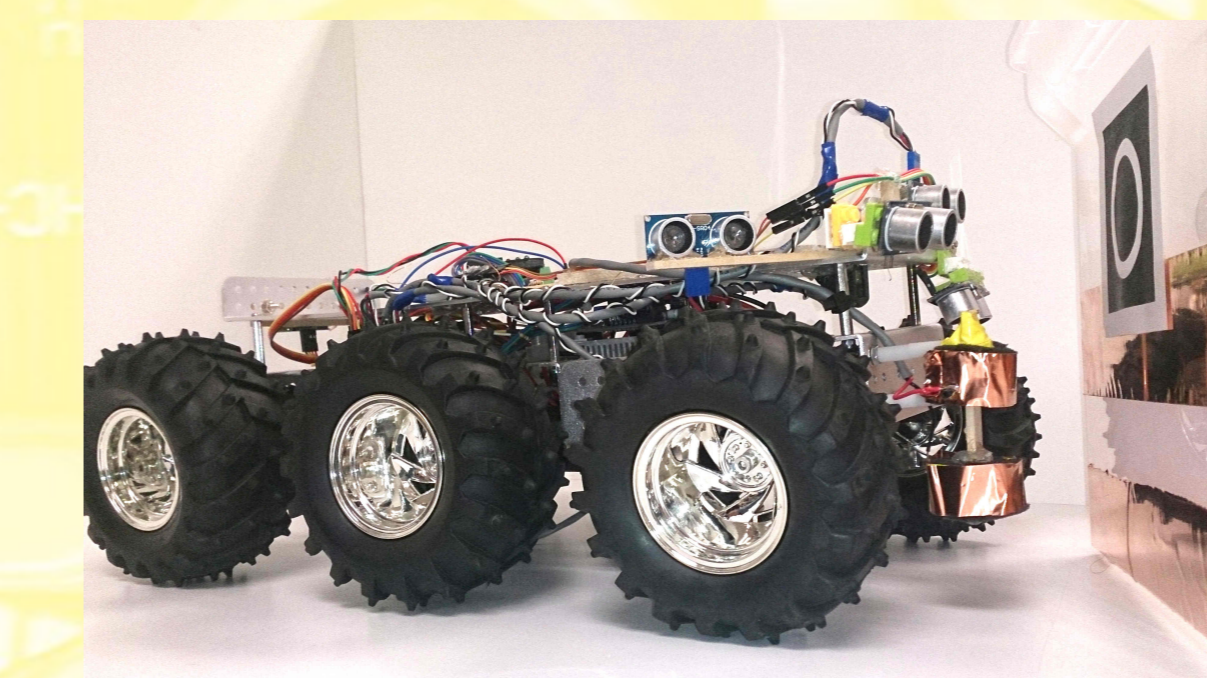


The second bot with charging interface

THE CHARGING

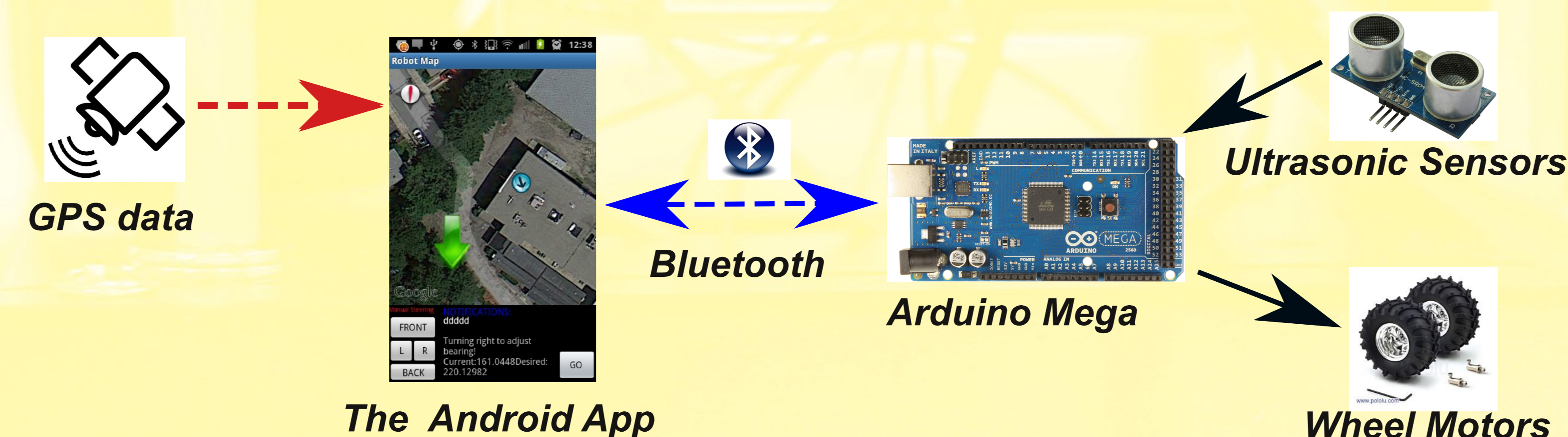


Charging station detection on camera

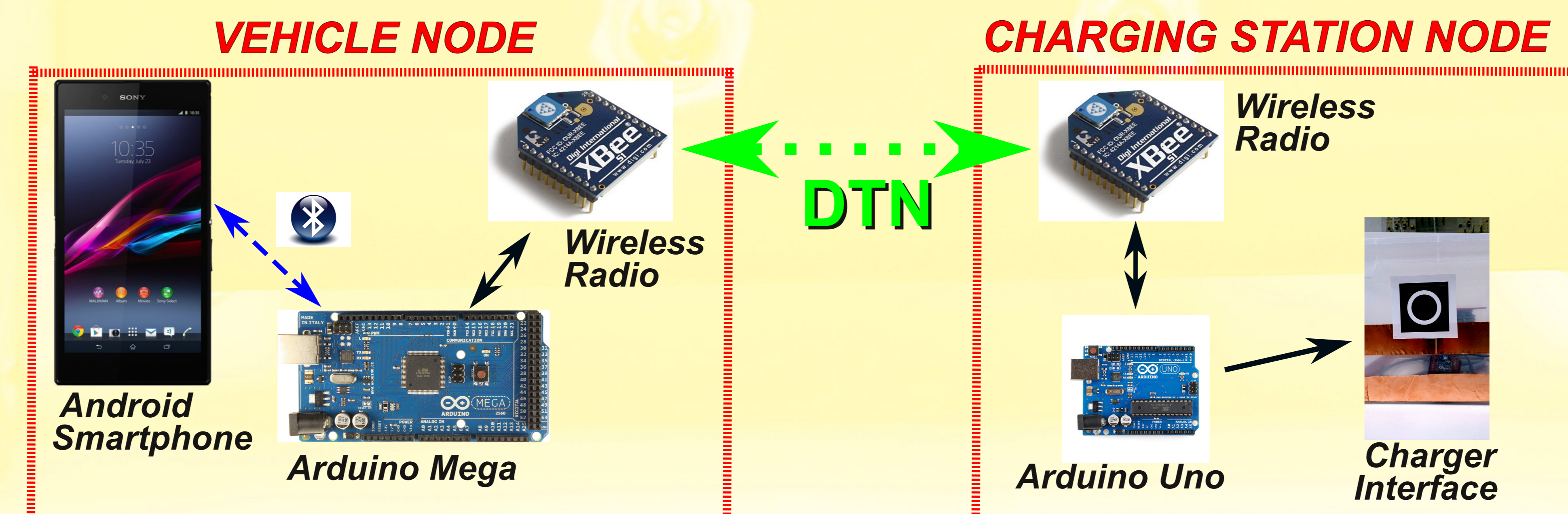


Docking to the charging station

THE NAVIGATION



THE COMMUNICATIONS



HOW CHARGING WORKS

- The bot navigates to suitable charging station when battery low
- Reserves station via DTN when in range
- Uses smartphone camera for precise docking to station
- Senses the charging voltage and begins charging
- Notifies station via DTN when charging is done and disconnects

RESULTS

Success at autonomous navigation and charging.
Working on integrating the DTN with the charging and navigation systems.

GOING FURTHER WITH DTN

- Sharing traffic data
- Detecting and relaying road hazards
- Relaying information for disaster relief
- Remote healthcare monitoring

ACKNOWLEDGEMENTS

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