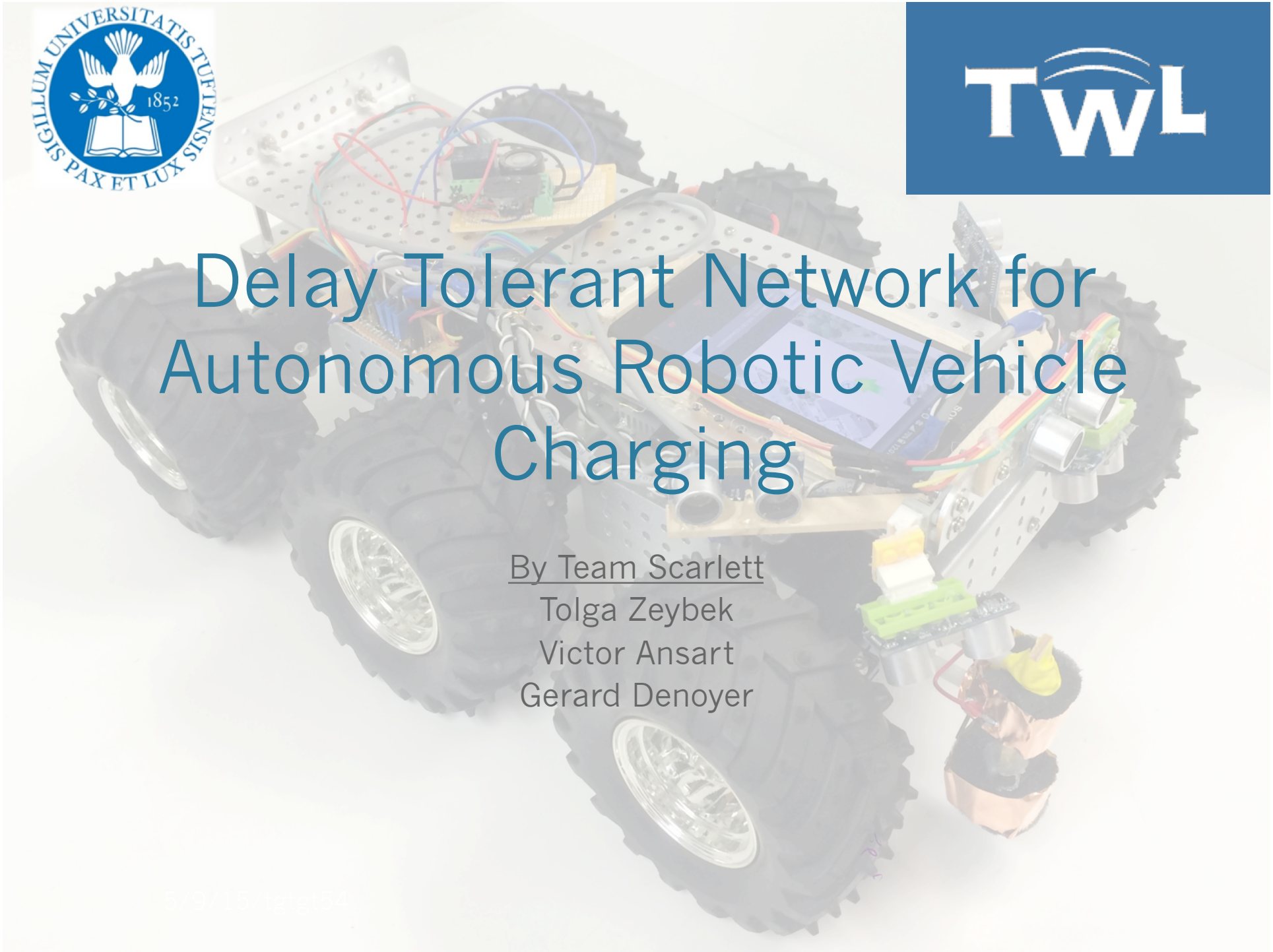
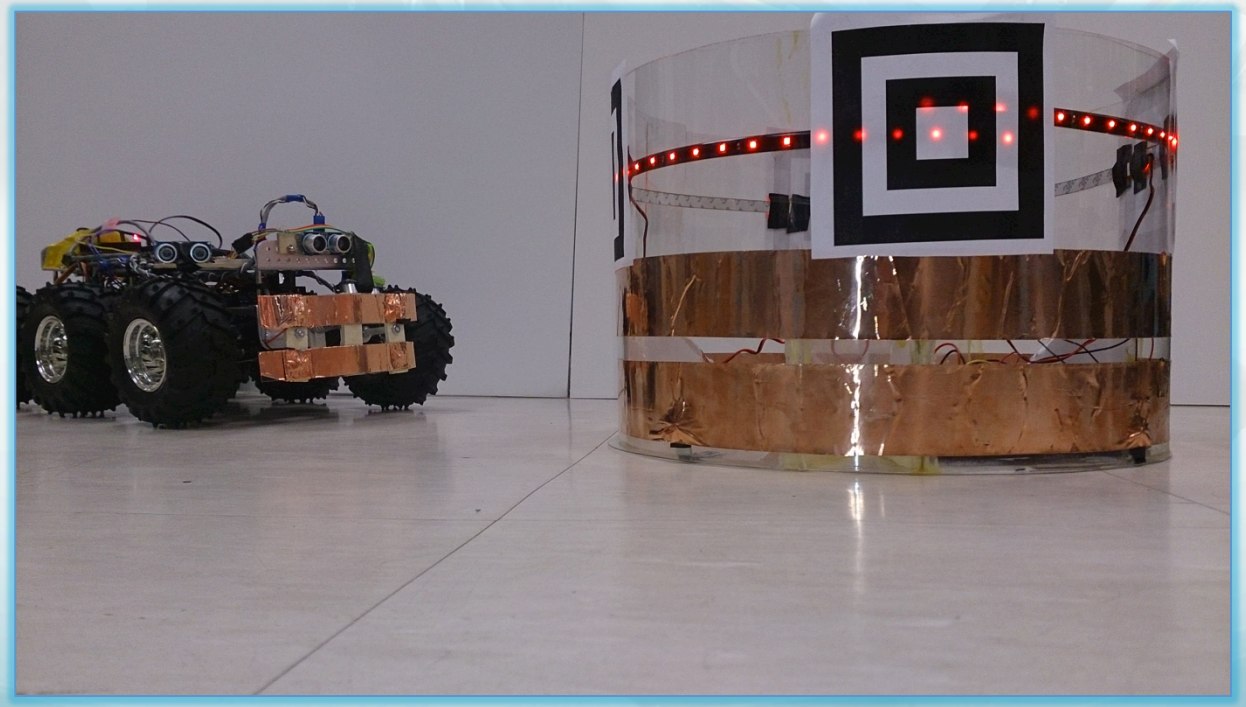


Delay Tolerant Network for Autonomous Robotic Vehicle Charging

By Team Scarlett
Tolga Zeybek
Victor Ansart
Gerard Denoyer

Problem Definition

- To have a robot autonomously find a charging station when running low on batteries using a Delay Tolerant Network (DTN)

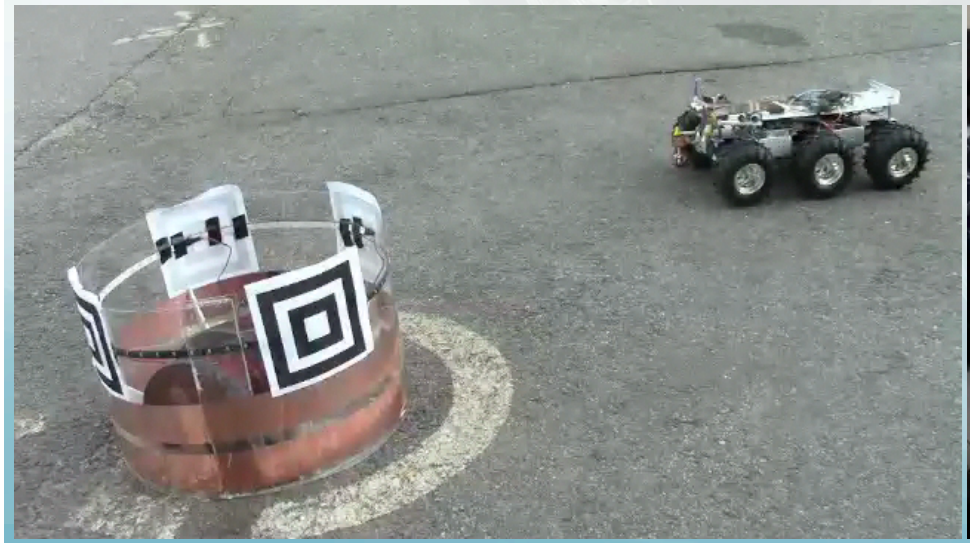


Possible Uses of DTN

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

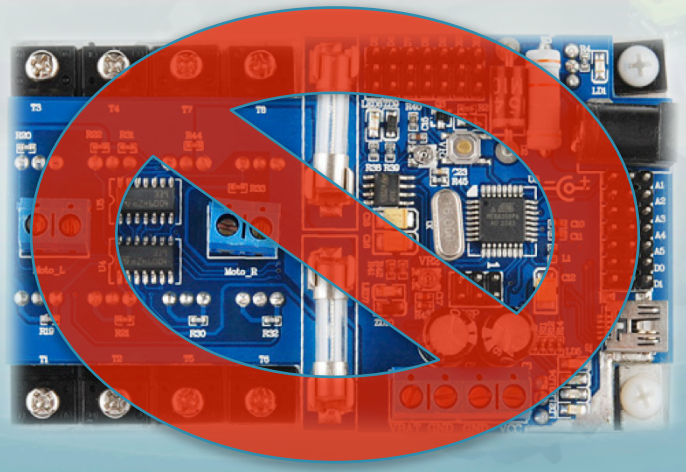
What Worked

- Reliable communications through DTN
  - Data exchanged within first 5 seconds
- Robot finds station, recharges within 15 foot radius
  - Using image detection techniques
- Robot navigates to a GPS location autonomously



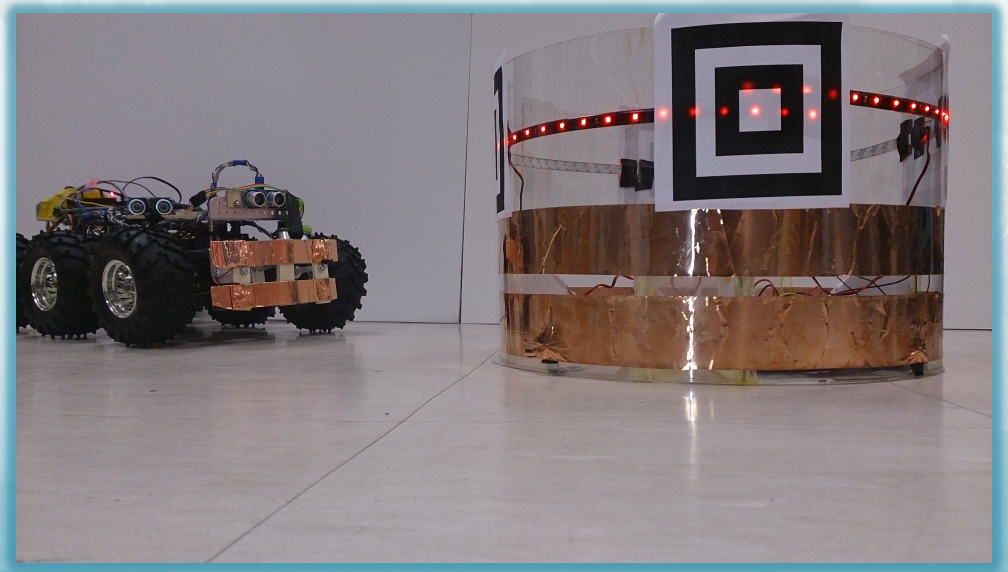
What Didn't Work

- 5 % of proposed project remains uncompleted
  - GPS/network conflicts caused unreliable autonomous navigation to charging station
  - GPS data caused irregular path movements
  - Transition to image processing control not field tested
- Motor controller unreliable and crashed



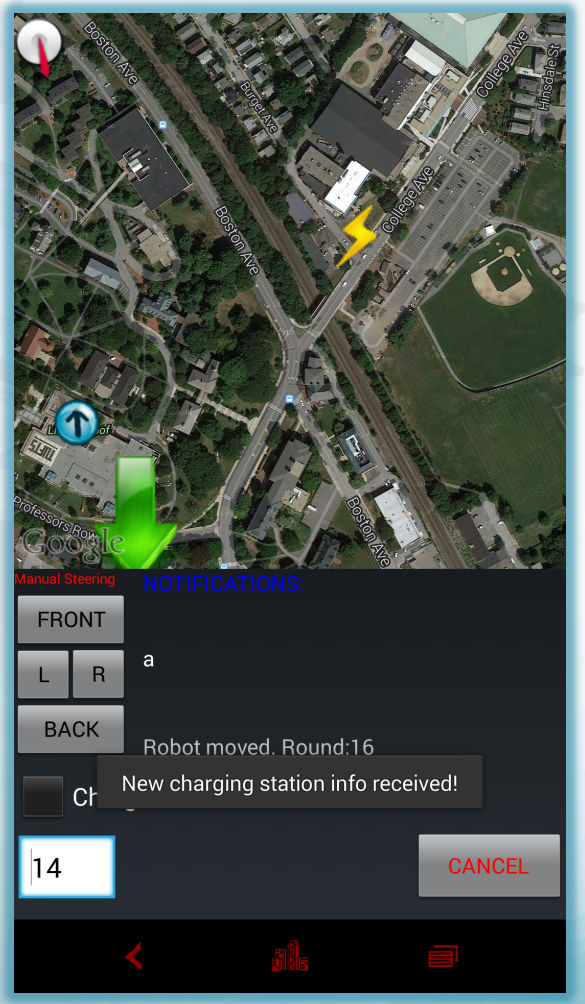
Greatest Obstacles

- Convert image detection code from C++ on the desktop to java in the android app → RESOLVED
- Integration of all subsystems → RESOLVED
  - DTN, image processing, autonomous navigation
- Field testing → IN PROCESS
  - Rain, poor GPS signal, breakage after impacts



Lessons Learned

- Code for desired final platform
  - Image detection in java
- Don't believe everything you read
  - GPS only worked in good weather
- Time management
  - Planning: realistic durations
  - Leaving things to last minute
  - Distractions
    - Tolga: Formula Hybrid Race
    - Victor: Course Croisière EDHEC
    - Kip: Tufts Venture Fund
- Work breakdown structure
  - Needed better division of labor

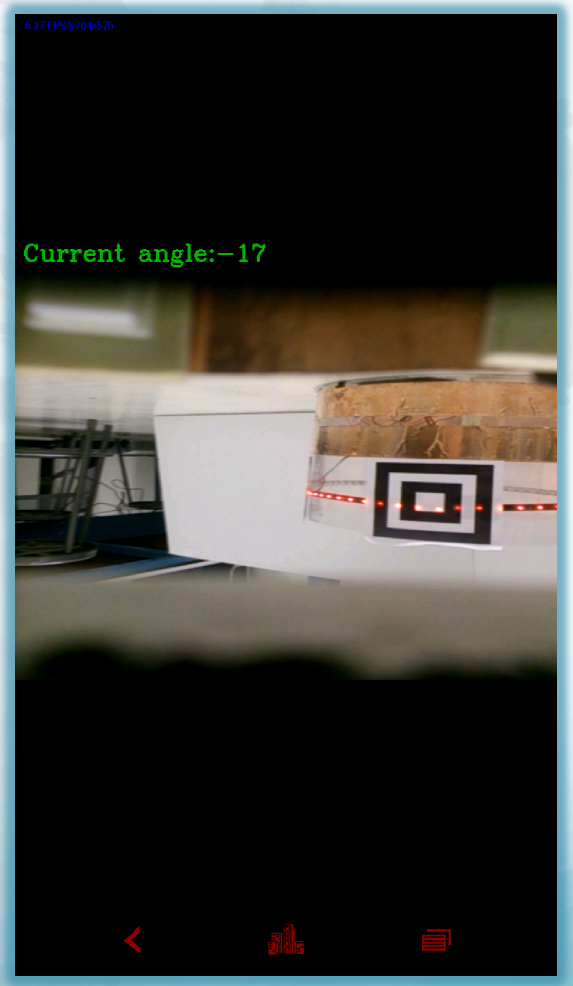


Ethical Considerations

- Benefits to society:
  - Reliable communications in remote areas
  - Implements “internet of things”
- Ethical Issues:
  - Need to maintain user privacy
  - Need to protect against hacking attempts
  - Need to protect against data harvesting methods

In Summary

- We are confident in our communications protocols
- Learned image detection
- Don’t be afraid to iterate
- We had fun!



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