Cognitive agent-assisted driving

A feasibility analysis for speed control

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Importance of respecting the speed limit

- Less time and space for braking;

- Increased peripheral vision;

- Less serious accidents;

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Forms of Inspection

Fixed Radar

Mobile Radar

Signs

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What they are...

Cognitive Agents
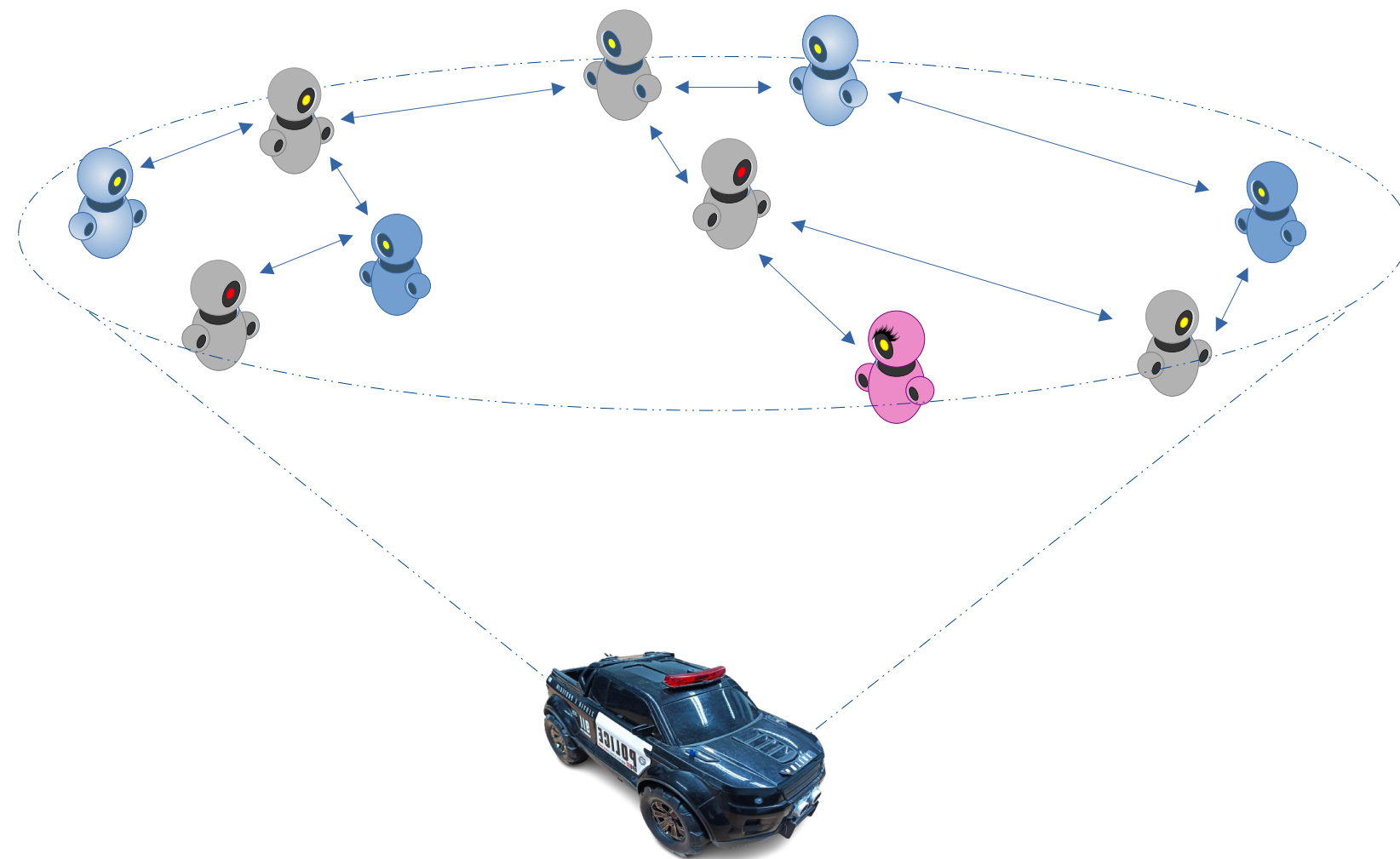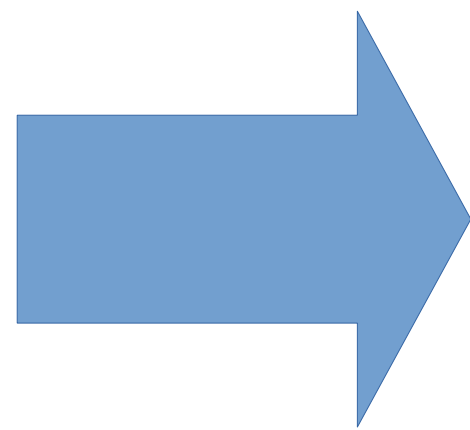
- They are autonomous entities of distributed AI;

- They make decisions based on their own goals and perceptions;
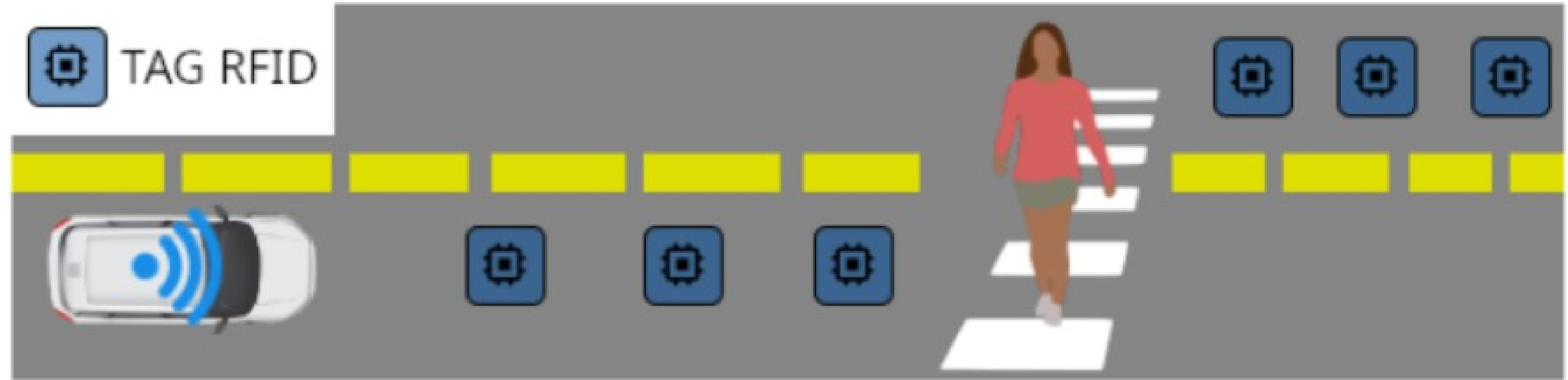
- They coexist in a Multi-Agent System (MAS);

Main Goal

- Analyze the feasibility of speed control:
  - By reading the signs on the roads;
  - Autonomously and collaboratively;
  - Based on agents;

Our Proposal
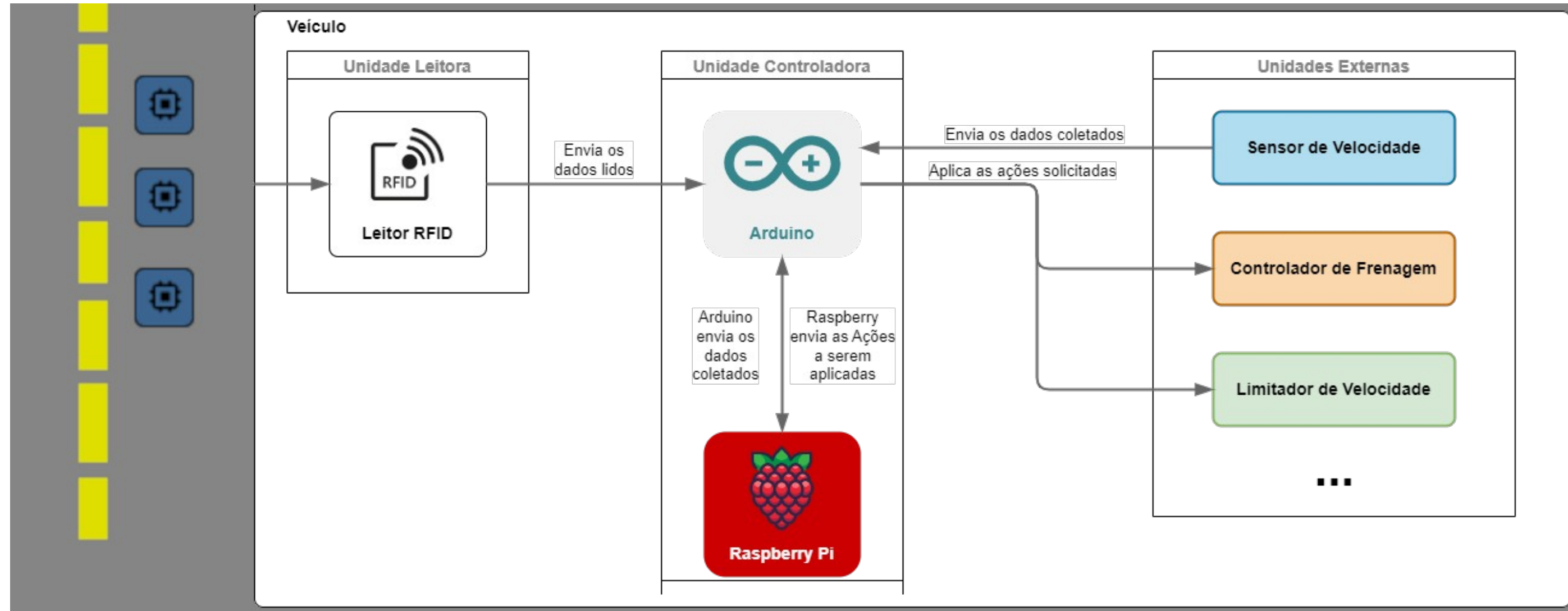
How will the speed control system be applied?

Figure of the physical architecture of a vehicle considering the need for autonomous speed control.

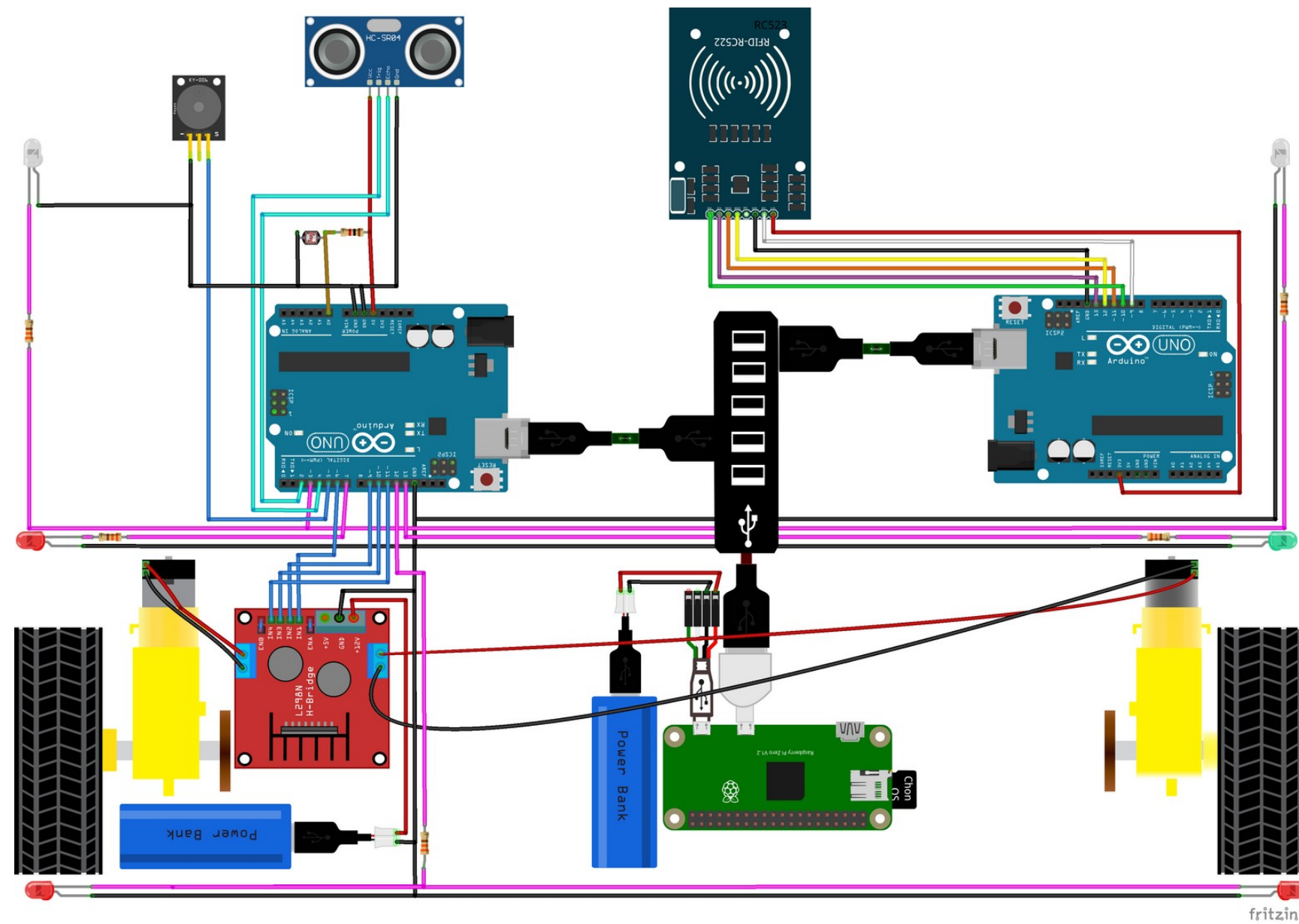Image of the prototype used (ChonBot 2WD - Cognitive Hardware On Network Basic Prototype 2WD)

Adapted circuit from the ChonBot 2WD prototype

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Case Study

- Three experiments were carried out:
    - Validation of the reading of the RFID chip data by the agent;
    - Communication between agents and the execution of actions by the agent for the prototype after reading;
    - The prototype reads several RFID chips along a circuit and performs speed adjustment actions;

- 1st experiment:
  - All readings performed and messages reported by the agent, via Arduino, faithfully corresponded to the data present in the chips;

Case Study

- 2nd experiment:
  - Communication between agents was successful, requiring only a few corrections to the copilot agent code to use the appropriate communication method for the pilot, and all actions performed by the pilot were successfully executed;

Case Study

- 3rd experiment:
  - The system was able to read and apply the actions determined in the program, however there were some problems during the execution of these experiments;

- Problems occurred in the 3rd experiment:
    - Inconsistency in the rotations of the prototype's motors, causing the prototype to move slightly tilted to the left and passing the RFID chip a few millimeters next to the reader, added to the low power of the RFID reader, the system was unable to read the chip and, consequently, the actions configured for the circuit section were not applied;

Case Study

Assessment

- Despite the problems that occurred during experiment number 3, it produced satisfactory overall results;

- It is possible for a vehicle to autonomously read the data from road signs and control vehicle speed in a manner consistent with the data read from the signs;

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Future perspectives

Conclusion

- Use of a more powerful RFID reader or an RFID chip with an antenna that allows vehicles to read the data correctly, regardless of the vehicle's position on the road;

- Application of encryption to the RFID chip, to allow only authorized agents to rewrite the data on the cards;

Future perspectives

Conclusion

- Evaluate the incorporation of collaborative systems into the current system through interactions between vehicles and traffic signs, through a system of contracts and rewards to inform drivers about any incidents that may have occurred meters or kilometers ahead;

- Another line of research would be to use the JaCaMo tool and adopt the Moise organizational model to manage traffic speed regulations;

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