Quick Sorting Delivery Vehicle

Frenetic Mechanics

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Problem

In industrial logistics, delivery machines are essential for efficiency enhancement. Nowadays, more and more small corporations take part in this logistic market and they apply the delivery machine in their factories. However, these existent delivery machines have the following limits:
1.They can only stay in place or have limited mobility;
2.They take up a lot of space but small corporation don't have large enough work area;
3.They are too costly and only accessible to big company.

Concept Generation

Our project aims at building a flexible, compact and economical sorting and delivery vehicle to help with the unmanned courier station, in a small working spaces.

Design Description

A delivery vehicle based on the radio frequency identification devices(RFID) and automatic tracking system is our final solution. It poccesses:
1.Accurate and rapid road detecting function and parking functions for a vehicle with the 360-degree ultrasonic locating system
2.Intelligent and accurate sorting system based on the RFID technology
3.Unloading area identification based on Arduino photosensitive sensors
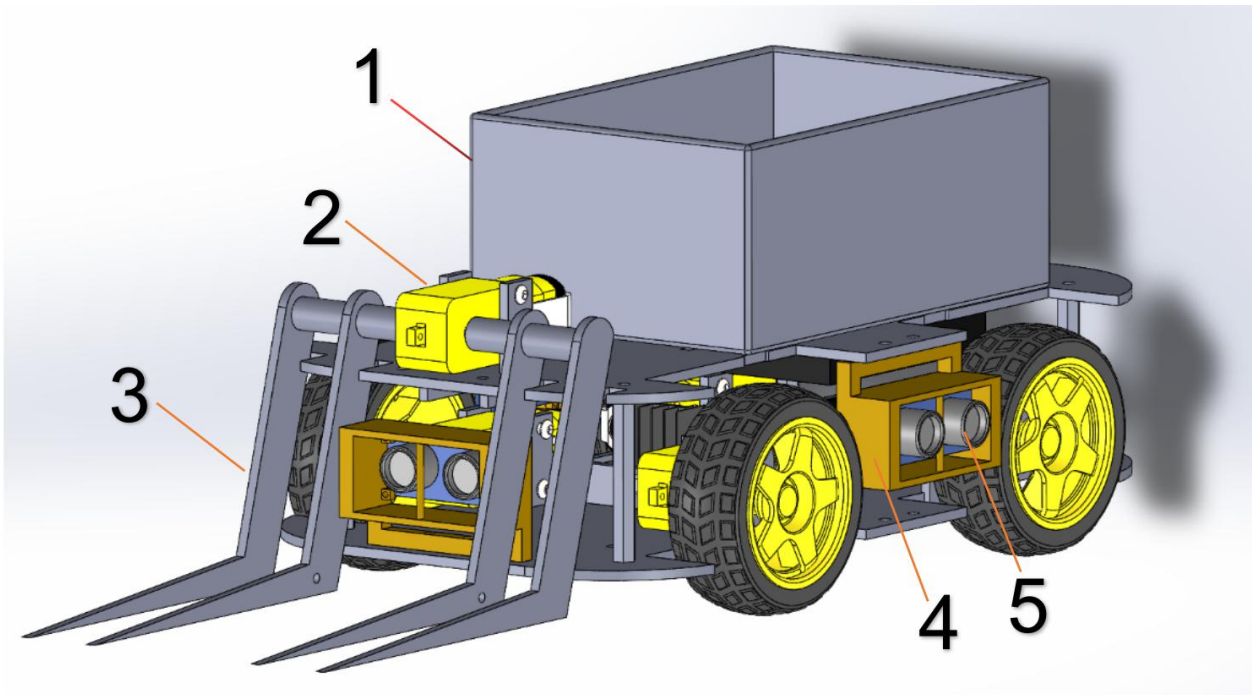4.Quick processing algorithm on the Arduino IDE

Fig. 1 The structure of the vehicle

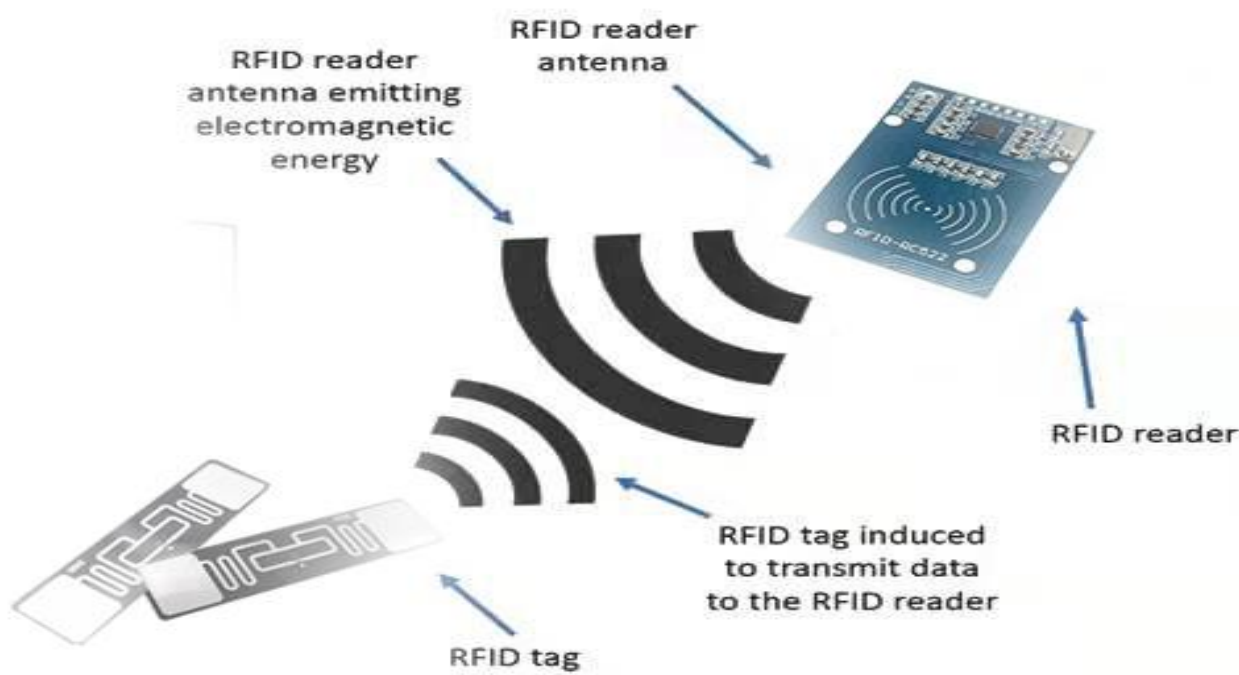| #	Key Component
1	Storage box
2	Motor
3	Mechanic arms
4	Ultrasonic sensors protector
5	Ultrasonic sensors

Table 1: Key components

Fig. 3 The RFID Module

Modeling and Analysis

Our whole procedure is devided into Four part. First we will buid the main part of our vehicle and attach the Arduino photosensitive tracking sensors to it. Then, we'll build the RFID module , which allows it to automaticly identify different packegaes. Third, we'll build the robotic arm for our vehicle, so that it can upload and unload packegaes. At last, we'll combine all these modeuls together.

Fast, Precise, and Human-free Uploading and Unloading

Fig. 4 Automatic uploading function

Validation

We did a sample test by testing the accuracy of the RFID module

technology in repeated and large-scale samples.

Table 2: RFID Accuracy Test Data

Turns	All Tests	Correct Tests	Accuracy
1	20	20	100%
2	100	100	100%
3	100	199	99.50%
4	200	248	99.20%

Among all the sensors of our vehicle, the accuracy depends mostly on the RFID technology. Therefore, by testing our RFID sensor with a large scale of data, we evaluated the overall accuracy of our sensor. However, to achieve more convincing results, we need to test more samples and assess the overall performance of our vehicle.

Conclusion

The project solves the problems by providing an effient and low-cost robot to identify, sort and delivery the packages. It's more than a delivering machine. It's a highly-intelligent robot with high precision and efficient performance. One possible improvement is to improve the flexibility of our robotic arm in order to pick up packages from different position. Our robot allows small business to sort and deliver packages in small area without any human labour, which not only increase the efficiency but also reduce the cost.

Acknowledgement