Counter Sensor for Environmental Sustainability

ENGR400 Project Proposal
Toolcomm Technology Inc. is an electronics engineering firm, located in Victoria, BC, specializing in custom engineering to suit our customer's needs. Areas of expertise include:

- Electronic Hardware
- Embedded Firmware
- Interface Software
- Mechanical Designs

Toolcomm designs custom tools and equipment using the latest in electronics, computer, and mechanical technology. Clients specify the function of the required tools or equipment, and based on these specifications, Toolcomm will design and build a prototype. Toolcomm engineers are particularly experienced in wireless data communication and telemetry solutions for process control and data acquisition utilizing data radio control and cellular communication. Custom engineered tools can include but are not limited to:

- Robotics utilizing a variety of technology
- DSP technology
- Remote Power
- Security devices and systems
- Electronic Sensors
- Embedded Servers
- RFID

Toolcomm is equipped not only for electronics design, but also for the production of 3D CAD models, software development on various platforms, and the creation of a full range of product documentation.

BACKGROUND

Toolcomm is involved in a few projects which have a focus in the area of environmental sustainability. One project idea, originating internally, addresses a recent non-energy-related environmental sustainability concern. Toolcomm believes that a solution to this concern has a strong possibility of developing into a marketable product. As such the exact details of the project cannot be revealed here. The participating team will be required to sign a non-disclosure agreement before learning more details. Additionally they will be required to sign over the intellectual property rights of the prototype developed to Toolcomm.

Though details of the project cannot be given here the problem has been generalized and included below. If a student is interested in the project, but would like to know more before deciding, they may sign a non-disclosure agreement prior to selecting the project. Ask the Design Engineering Office for details.

RESOURCES

Toolcomm has a well equipped electronics design facility located in Victoria that the student design team will have access to under supervision. A professional engineer will serve as the company contact. Finally if the company is satisfied with the detailed engineering design they will supply the components for the creation of the prototype.
**PROBLEM DEFINITION ILLUSTRATION**

Imagine that you and a friend are each standing on either side of a door. The door has rectangular hole in it that resembles a mail slot without its cover, the edges to the hole are slanted inwards as shown below.

![Diagram of a door with a rectangular hole and slanted edges](image1.png)

At the edges where the hole in the door forms, there is a canal as shown below:

![Diagram of a canal at the edges of the door hole](image2.png)

Now you and your friend want to shoot peas through a straw at each other. The peas follow one of the following actions:

1. Bounce off the slanted edge without going through the door
2. Get stuck and roll around in the canal at the hole and possibly bounce through the door eventually
3. Go through the hole

The problem we want solved is a ‘Pea Counter’ which will provide data telling the number of peas that successfully makes it from one side of the door to the other side.
For the actual implementation this ‘Pea Counter’ will be in a very dirty environment, so choosing the correct sensors will be a challenge. Sensor design is expected to be the difficult part of the project. The next difficult task will include algorithm design for the microcontroller which interfaces the sensor.

This is the general problem but more detail will be provided when the team signs the NDA and I.P agreement.

CONCEPT

The system will log the amount of peas which travel all the way through the hole in the door in either direction. Logged data will be preferably stored on fast memory (internal flash) and will be serially accessible for data transmission or downloading. Toolcomm Technology Inc will design the power supplies and data communication modules. The design team will have the responsibility of proposing and preferably prototyping and testing a sensor which accurately detects the data. When the team has a prototype ready for intensive testing Toolcomm Technology will provide a complete system test facility.

It should be noted that this is a project that Toolcomm engineers have discussed and not found an easy solution. The students who participate should be ready to tackle a challenging sensor issue.

We look forward to working with you.
Sincerely,

Toolcomm Technology Inc.