**Proximity Sensor Based Rebar Counting**

**Abstract**

The Rebars (Reinforced Bars) are manufactured at New Bar Mill (NBM) in various dimensions viz., 10mm, 12mm and 16mm in diameters.  The Rebars are generally sold in units of 12 meters each. As there is presently no mechanism of counting the bars, they are sold based on weight, from the plant to the distributors.

The challenge is these Rebars are difficult to be counted manually at the plant, due to their high volume in numbers. The rate of production of Rebars is also high and thus there is a requirement to develop a method that will automatically count the Rebars quickly. Additionally, Rebars cannot always remain at the same level when they are strapped in a bundle. They are sometimes jutting out from the main bundle which adds to inconvenience.

We are planning to count the rebars with the help of a sensing plate. The sensing plate can be anything which responds to some obstacle present in front of it. For example it can be

1. A capacitive sensor used in touch screens.
2. An infrared led-photodiode sensor used in proximity sensors in mobiles.
3. A photosensitive plate used in cameras.

Now once the sensing plate detects obstacles, the data pertaining to obstacles can be analyzed to get a rough number of obstacles. This can be done by computer programs.   
The rough number obtained can then be optimized (for example taking more than one reading and then taking average or taking readings at different angles of plane of plate and that of rebars plane and then analyzing all the rough numbers to get to a more accurate number) to get a more accurate number of rebars.

The capacitive sensors are short range and hence are difficult to prepare for intended use in the problem of rebar counting. The photosensitive plate (one used in cameras) is best suited for this problem and is also easily available but the image processing required to analyze data will be very difficult to be learnt and applied within this short period of time. Infrared sensors provide sufficient range and data of an infrared led-photodiode can be analyzed easily so we will demonstrate our idea with the help of infrared proximity sensing plate although it is not best suited for accurate counting and will have certain errors. But accuracy will certainly increase when sensors density is increased further.

To minimize errors we will be counting large rebars having diameter of about 2.5cm (this was discussed by Shailesh Ganpule sir and he agreed on this).

**Members in Group**

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| **Name** | **Enrollment No.** | **Batch** | **Work** |
| RITESH RAJAN | 16117071 | Q5 | Design, Coding, Testing |
| ROBIN SHARMA | 16117072 | Q5 | Design , Wiring |
| SAGAR MADHEKAR | 16117075 | Q5 | Circuit drawing, Wiring, Analysis |
| SAURABH SONKER | 16117078 | Q5 | Coding , Analysis and Testing |
| SAMEER FARHATH | 16117080 | Q5 | Circuit drawing , Wiring |
| SHARIL KHAN | 16117082 | Q5 | Coding , Analysis and testing |

* **Team leader** will be **Ritesh Rajan (16117071)**

**Preliminary Work Plan**

This project involves following work:

* **Research and Design:** In this step the planning of IRLEDs and Photodiodes on sensing sheet has to be planned. This has to be done by carefully studying the orientation of bars on sheet and realizing what is maximum number of IRLEDs and photodiodes are blocked by the rebar.
* **Circuit Diagram:** The sensing sheet will consist of nearly 200 photodiodes and 40 IRLEDs. So proper circuit diagram has to be constructed to ensure minimum mess and cost. IRLEDs will be powered by batteries and photodiodes will be powered by Arduinos.
* **Wiring:** Once circuit diagram and design is complete, next step is to make real connections to battery, Arduinos (microcontrollers), LEDs and photodiodes. This will involve soldering and many other skills.
* **Coding:** After wiring, next step is coding in which the input received by sensors (photodiodes) is analyzed. This is done by Arduinos (microcontrollers) and a computer.
* **Testing and analysis:** This is final step and involves various optimization techniques to minimize the error in counting.   
  This step is purely experimental and will be realized by making changes in coding once the device is fully functional.