**(8223) INTRODUCTION TO COMPUTER ENGINEERING**

**ASSIGNMENT 1**

**SHOMIT BASU**

**STUDENT ID: 3294488**

**STEP 2:**

**1. EXPLORING ALTERNATIVES**

**Solution A: The Two Sensor Solution**

In this solution, we capture the motion of the train through sensors. Two sensors shall be placed. The first one senses the approaching train, and the other one shall indicate if the train has passed or not. A motion detector camera will also be placed to check whether a vehicle has damaged itself or has become immobile on the tracks. The logic will be quite simple:

* Lower Gate if train is approaching in accordance with Sensor 1
* Raise Gate if train has passed in accordance with Sensor 2
* Signal Red for the train to stop, if a vehicle is stuck on track

**Solution B: The Four Sensor Solution**

In this solution, four sensors will be installed. Here, we first capture the motion of the vehicles instead of the train. Let, the two sensors for the vehicles be Sensor Set 1 and the two sensors for the train be Sensor Set 2.

**Sensor Set 1** detects vehicular motion. It performs the following functions:

* Gates Raised when vehicular motion is detected (signal for train turns yellow)
* Gates Lowered when no vehicular motion is detected (signal for train is green)

**Sensor Set 2** detects the motion of the train. It performs the following functions:

* Lower Gates when train is approaching (signal for vehicles becomes red)
* Raise Gates when train has passed (signal for vehicles become green)

This solution poses a significant challenge. Speed of the train is regulated, that is why it is easier to control traffic lights for the vehicles. But vehicular speed is variable which poses a threat for controlling the signals for the train as Sensors Set 1 can often falter due to the constantly changing speed of the vehicles. This might cause a huge collision between the train and the vehicle, as the traffic signal won’t be able to communicate appropriately due to the faltering sensors.

**Solution C: An Alternative Four Sensor Solution**

The problem stated above, can be fixed in this solution. The setup for this solution is totally similar to Solution B, with only one major modification.

The Vehicular Sensors i.e. Sensor Set 1 will not affect the train signals like it did in the previous solution. Therefore, if the first sensor of Sensor Set 1 detects a vehicular motion which is not received by the other sensor (of Set 1, itself) within a determined set of time it would mean that a vehicle has become immobile and has got stuck on the tracks. Only, in that case, an emergency alarm sets off, which makes the approaching train aware of the existence of the immobile car on the track. Accordingly, the train must slow down and stop.

**2. ONE REAL WORLD EXAMPLE OF A CROSSING GATE CONTROL SYSTEM**

Automated safety systems overseen by the Australian Level Crossing Assessment Model (ALCAM) are frequently used to regulate railway level crossings in Australia. For instance, the system detects incoming trains at **busy crossings in New South Wales** by using trackside **sensors** positioned several hundred meters ahead of the crossing. Boom gates are lowered after warning bells and flashing lights are activated in response to the detection of a train. Before the gates are raised, more sensors verify that the track is totally clear after the train has passed. This multi-layered strategy minimizes false operation, guarantees high reliability, and gives all road users enough warning time.