**Project Title:** Wireless V2I Communication Protocols for Driver Assistance  
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**Proposed Concept & Specifications:**The proposed concept of our project is to allow a vehicle to conduct bi-directional communication with road infrastructure. Standard communication protocols in this area include Bluetooth and ZigBee. Bluetooth communication was chosen for this project due to “the downside of lower data rates” [1] that the ZigBee protocol gives us. Using Bluetooth low energy beacons, road infrastructure could send a short message containing a URL to a vehicle. The vehicle, assuming it has internet connection, can read this URL and access the webpage. A Raspberry Pi will be powered using a standard power bank and it will be connected to a vehicle when testing. Upon opening the web page, the onboard computer on the vehicle can read information from the web page and process this information. The information on the web page would most likely be in XML form. Once the information is processed, it can be displayed to the driver, informing them of such situations as traffic ahead, closed roads, roadworks or inform the driver if they are driving above the speed limit.

**Project Goals:**There are three main goals in conducting this project. Firstly, we would like to evaluate the usefulness of Bluetooth as a V2I communication protocol and to highlight its potential strengths and weaknesses. One example of a weakness from a previous study being “in several tests at higher speeds Bluetooth devices could connect, but they were unable to exchange any correct message” [2].

Another goal of conducting our project is to circumvent or limit the time-consuming effect of the handshake protocol. “Measuring handshake time between devices is an important test when it comes to implementing a communication technology in a vehicular environment characterised by a small window in time in which a vehicle can transmit and receive data to/from road infrastructure equipment. As in many applications the amount of data that is to be transmitted is not high, the communication handshake appears to be the main parameter to be considered in deciding the proper communication technology to be implemented in vehicular environment”[3].

Lastly, we would like to examine the potential application of this technology in V2V communication. Using this technology for V2V communication may improve range by having more nodes to transfer data or it may congest the network.

**Supplies Necessary:**Raspberry Pi 3 (Available), Smart Bluetooth Low Energy Beacon (€14- €18), power-bank (Available).

**Referenced Literature Reviews:**[1]Gheorghiu R.A. & Minea M. (2016), “Energy-efficient solution for vehicle prioritisation employing ZigBee V2I communications”. [Online] Available at: https://ieeexplore.ieee.org/document/7754691

[2]Iordache V., Gheorghiu R.A., Minea M. & Cormos A.C. (2017), “Field testing of Bluetooth and ZigBee technologies for vehicle-to-infrastructure applications”. [Online] Available at: https://ieeexplore.ieee.org/document/8246274

[3] Gheorghiu R.A., Iordache V. & Cormos A.C. (2017) “Analysis of handshake time for bluetooth communications to be implemented in vehicular environments”. [Online] Available at: https://ieeexplore.ieee.org/document/8075955