UREP 21-136-2-055:
Line-Tracking Smart Car with Edge-based Path Recognition and Dual-PID Control Strategy

18 March 2020
Project Description

This proposal is mainly conceived to help and motivate the undergraduate students in engineering background to participate in the NXP Cup, which was initiated in 2003 and is now a global competition where student teams build, program, and race an intelligent car around a track for speed. It is a collaborative, competitive, and hands-on way for students to learn engineering techniques. Owing to the widespread usage of microcontroller and automation devices, it has become imperative for engineering students to gain a solid understanding of these devices.
Design Prototypes

Figure 1 IR-sensor Based
First prototype using Arduino control unit and motor driver shield to test the algorithm and to prepare for the advanced car design.

Figure 2 Image Based Design
Final imager-based smart car prototype with all the required components tested.
Achievements and Outcomes

1. Learning experience: Students learned the skill-set related to the analysis, design, testing, and debug a complicated smart car system including i) sensing, ii) signal processing, iii) control, and iv) mechanical design. Students have acquired solid foundations in building both software and hardware for real-life applications.

2. Initiation to research: Throughout this project, the students acquired a solid research experience involving i) performing a literature review, ii) defining the research problematic iii) proposing a methodology as well as implementation and validation of whole systems involving both software and hardware.

3. Building real-world prototype and demonstrator: The students have successfully implemented 2 smart car systems that involve both hardware and software. Students have been exposed to prototype design as well as debugging and validation. Moreover, the students were exposed to real product design chain, from device procurement, assembly, debugging, testing, re-prototyping, etc. These experiences would greatly help them in their future career.