The IDEA: Intelligent Driving Efficiency Assistant
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EXTENDED ABSTRACT

Purpose
The Embry-Riddle Aeronautical University senior design students are participating in EcoCAR: the NeXt Challenge, a three year long continental competition hosted by General Motors and the U.S. Department of Energy. The purpose of the contest is to further the advancement of technology toward reducing greenhouse gas emissions and reducing petroleum consumption in vehicles while exploring a wide variety of breakthrough technologies and techniques. Embry-Riddle’s Computer and Software Engineering design team is developing a control system called the Intelligent Driving Efficiency Assistant (IDEA). This system will be integrated into a hybrid vehicle and used to intelligently improve and track the operating efficiency. Using artificial intelligence, the IDEA will analyze different components within the vehicle such as terrain, speed, and power consumption. This system will also monitor, record, and learn traffic patterns based on the vehicle’s position using a GPS. The IDEA will preemptively predict and analyze environmental variables ahead of the vehicle and, based on the AI algorithms, recommend the most energy efficient hybrid mode of operation for the upcoming conditions.

Development Process
The design team comprised of senior computer and software engineering students are working with a development process known as the Crystal Clear Process*. Crystal Clear utilizes the ideas of reflective development and osmotic communication by co-location to frequently deliver usable code or products for the user. The design team runs on two-week iterations, where the team delivers a set of functionalities toward the overall goal of the project at the completion of each iteration. In addition, at the end of each two-week block, the team undergoes a “Reflection Workshop” in which the team analyzes the process of the past two weeks and discusses what worked best, what needs to be improved and what should be tried for the next iteration.

Team Structure
The group of fourteen individuals is divided amongst five teams—Hardware, Database, Software in the Loop (SIL), Intelligence, and User Interface. Each team has a designated leader responsible for team productivity and management. The Hardware team is responsible for choosing and integrating all necessary hardware elements in order to ensure proper execution of the IDEA system in an automotive environment. Members of the Database team are dedicated to designing and developing a central database system such that the IDEA can operate effectively and quickly, with necessary stability and memory management. SIL members are responsible for designing and developing a seamless SIL testing environment for the system. Responsibilities of the Intelligence team include designing and developing the artificial intelligence modules of IDEA including rule-based inference engines and a voting scheme to recommend the most efficient mode of operation. Members of the User Interface team focus on integrating a user friendly display into both the testing environment and vehicle environment for the IDEA.

Result
Each team is working to complete their individual objectives. The goal is to ultimately integrate each team’s system to create a final product that can be used in the EcoCar target vehicle, a 2009 Saturn Vue. The IDEA system will be presented before a panel of contest judges, made of academic, industry, and government professionals, at the end of the academic year.