Idle Stop Technologies using ICT for high gas mileage

Dr. Myunghee Son
Nov. 6\textsuperscript{th}, 2008
Outline

- Idle Stop Vehicle
- Proactive Idle Stop Vehicle
- Proactive Idle Stop Architecture
- Proactive Idle Stop Prototype
## Introduction

- According to the Kyoto Protocol, the environment related automotive regulations have strengthened.

- The portion of renewable energy among total energy will be 1% (currently, about 0.4%) on 2020 year.

- The necessity of energy-saving technology was growing stronger before developing alternative energy.

- Several leading auto-makers have studied idle-stop control device which stops engine while idling in traffic.
  - Honda Insight Idle Stop car, BMW stop-start systems on its 1 and 3 series, as well as the Mini Cooper sold in Europe, and Hyundai i-20 planned in Europe.
What is an Idle stop vehicle?

- To prevent unnecessary fuel consumption and exhaust emissions, the engine is turned off when there is no need for propulsion or air conditioning.

Conditions for Engine Stop
- Vehicle speed is less than 4km/h & the brake pedal is pressed
- Engine speed is less than 1000 rpm

Conditions for Engine Restart
- A gear is selected with the clutch disengaged
- The brake pedal is release or the accelerator pedal is depressed with the transmission neural position

- The major drawback to such an idle stop vehicle is difficult to prove the effectiveness in drive.
What is a Proactive Idle Stop vehicle?

- **Why PIS vehicles?**
  - To guarantee the potential savings in fuel (5–8% on average and over 13% for the light) and emissions in driving a used vehicle
  - Simplicity and low cost are major attributes for used vehicles

While a driver is waiting at the red light, the PIS system gets the red interval from the Local Controller in order to decide the engine stop.
Proactive Idle Stop Prototype

PISCU Navigation Unit

Specification

- CPU: AMD Alchemy AU1250 500MHz
- System Memory: 128MB (64MB x 2) DDR2 SDRAM
- Display: 4.3 inch Wide Digital TFT LCD (480 x 272 Resolution)
- O/S: WinCE.net 5.0

Application

- PIS Control & Management
- Traffic Light Display
- Vehicle Status Display
- Decision of Engine OFF/ON while a vehicle is idling for the traffic red light
Proactive Idle Stop Prototype

PISCU Relay

- Specification
  - MCU: MC9S08DZ60 (freescale)
    - CPU: 40MHz 8-Bit HCS08
    - Memory: 60K
  - Power: 5.0V/150mA
  - Size: 60 mm X 70 mm

- Application
  - Extraction of a vehicle state information from ECU on CAN communication
  - Support of the interface with a navigation (Platform of PISCU) on USB
  - Support of the communication with RF receiver on UART
  - Transmission of Engine OFF/ON signal from a platform to a engine actuator on RS–485
Proactive Idle Stop Prototype

RF Transmitter & Receiver

- **Transmitter Specification**
  - MCU: ATmega164P
  - RF Module: CC1070
  - Supply Voltage: 5V/300mA
  - Interface
    + RS232c
    + 447 MHz
  - PCB Size: 60 mm x 70 mm

- **Receiver Specification**
  - MCU: ATmega164P
  - RF Module: Mlx1170
  - Supply Voltage: 5V/300mA
  - Interface
    + 447 MHZ
    + UART 3.3V TTL
  - PCB Size: 25 mm x 60 mm

- **Application**
  - Collects Red Light Interval (RLI) from Traffic Signal Controller
  - RLI is delivered to car using wireless communication
  - An RF receiver in a car sends RLI to PISCU Relay through UART
Proactive Idle Stop Prototype

**Engine Actuator**

- **Specification**
  - MCU : ATmega644P
  - Supply Voltage (12v/1A)
  - Interface
    + RS485 Full Duplex Serial Port
    + Relay Actuation or FET (Field Effect Transistor)
  - PCB size : 60 mm x 40 mm
  - External Memory : EEPROM 4K

- **Application**
  - Control Starter Motor
  - Control Main Supply Voltage Signal of PR using Key Information
Test Car
Proactive Idle Stop Test Car

ICT converged Idle stop car
Proactive Idle Stop Test Car

PR sticker
PISCU Relay
PISCU Relay Prototype

ECU interface

Navi interface
Connection b.w. PISCU Relay and Car
RF Tx & Rx Prototype
RF Receiver Prototype

- **RF module**
- **MCU**
Demo. for RF communication
Engine Actuator
Engine Actuator
Top side

PR interface

Key box interface

LED for status check
Engine Actuator
Bottom side

MICOM
ATmega644
Ultrasonic Sensor
Ultrasonic sensor

DC to DC Converter (12V → 24V)
Measured distance

MicroAutoBox connector
Navigation
Initialization
Traffic Light Display in the map
Light Controller
Exhibition

**KES2008** (Korea, Oct. 2009)

**CES2009** (Las Vegas, Jan. 2009)

See you CES 2009 !!
Thank you.

Q&A: mhson@etri.re.kr