Project proposal
For
Internet of Things
Lab 2015

Project Domain – Industrial Automation, Automotive, Renewable Energy/Power, Safety & Security, Wireless, Automation, Medical/Assistive Technologies

IOT ASSISTED CAR

NIT-Trichy

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Abstract

For the racing cars that are assembled in our college, an electronic system needs to be interfaced so as to make the car more interactive and also allow the driver to know the internals of the car during the ride. The proposed electronic system will measure the gear oil level and the fuel level and shall send the data to the driver as well as those at the pits. This would involve the use of microcontroller namely the Arduino Mega, use of sensors to measure levels, zigbee communication protocols and system to manage the data.

Market Analysis

The current situation of the cars that are being assembled in college, is that they do not possess any electronic system unit to help the driver. This system would ensure the user knows the current stats of the car. It is more cost efficient than what we can get from an electronic system unit purchased outside.

Project Description

SENSORS

<u>Fuel Level and Gear oil level sensor</u>

1)HRXL-MaxSonar- WR/WRC Series

Focusing on MB-7389

PRECISION FEATURES:-

- Range-finding at a fraction of the cost of other precision rangefinders
- Reading-to-reading stability of 1-mm at 1-meter is typical
- Compensation provided for target size variation and operating voltage range
- Internal temperature compensation is standard
- Optional external temperature compensation
- Easy to use Component Module

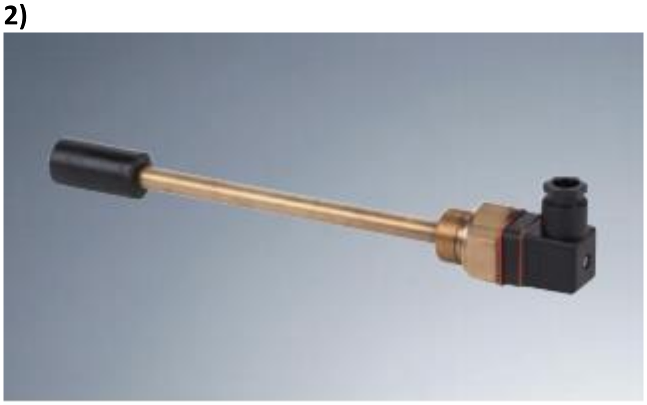
- Stable and reliable range readings and excellent noise rejection make the sensor easy to use for most users
- Easy to use interface with distance provided in a variety of outputs
- Target size compensation provides greater consistency and accuracy when switching targets
- Sensor automatically handles acoustic noise
- Small and easy to mount
- Calibrated sensor eliminates most sensor to sensor variations. Range Free run operation with superior noise rejection
- Operating temperature range from -40°C to +65°C

HR-MaxTemp, an External Temperature Sensor
Although the HRXL-MaxSonar-WR has an internal temperature sensor; for best accuracy, we are encouraged to use the optional external temperature sensor. On power-up, the HRXL-MaxSonar-WR will automatically detect an attached HR-MaxTemp temperature sensor and begin to apply temperature compensation using the external temperature sensor. The external temperature sensor allows for the most accurate temperature compensation, by allowing temperature readings to be taken that better reflect the composite temperature of the acoustic ranging path.

FEATURES OF MB-7389

• Factory calibrated beam width
• Low operating voltages from 2.7V to 5.5V
• All range outputs are active simultaneously
• Superior clutter rejection

2)



- Electrical level and temperature control
- Suitable for mineral oils
- Available either with 2 level contacts or 1 level contact and 1 temperature probe
- Electrical switch: decreasing level - break contact,increasing temperature -„break contact“

3)

- Up to 4 programmable switching terminals to be selected either as level or temperature signal
- Combined continuous control of level and temperature
- Perfectly visible LED display, swinging by 270°
- Easy to program

2 x M12 plug bases 4 poles
Programmable analog output as 4-20 mA, 0-5V, 0-10V

Automotive Ultrasonic Fluid Level/Quality Measurement Reference Design

TIDA-00322,TDC-1000

Description

This TI reference design is an automotive Level/Concentration/Quality/Temp fluid measurement system. It is intended to use Ultrasonic measurement based on the C2000 and dual channel TDC1000-Q1 Ultrasonic AFE. This solution supports 4.5-40V system capabilities with reverse battery protection.

This reference design can also be used with the TDC1000 for industrial/consumer applications.

Features

- Dual Channel Analog-front-end for ultrasonic sensing
- High voltage circuit to drive the transducer with 30V to penetrate deeper tanks
- Input voltage range of 6V to 40V with reverse battery protection
- Automotive qualified Bill of Material
- External RTD Measurement to monitor temperature changes that affect the medium's speed of sound
- CAN transceiver for flexibility of adding future CAN stack

MICROCONTROLLER TO BE USED

Arduino mega 2560
This microcontroller will suit the conditions and the environment. It is also robust thus can be implemented with the car. The large number of pins and several other features on offer further enhances its capability for this project

COMMUNICATION

XBee Pro 60mW Wire Antenna - Series 1 (802.15.4)

This is the very popular 2.4GHz XBee XBP24-AWI-001 module from Digi. The Pro series have the same pinout and command set of the basic series with an increase output power of 60mW! These modules take the 802.15.4 stack (the basis for Zigbee) and wrap it into a simple to use serial command set. These modules allow a very reliable and simple communication between microcontrollers, computers, systems, really anything with a serial port! Point to point and multi-point networks are supported.

Features:

- 3.3V @ 215mA
- 250kbps Max data rate
- 60mW output (+18dBm)
- 1 mile (1500m) range
- Built-in antenna
- Fully FCC certified
- 6 10-bit ADC input pins
- 8 digital IO pins
- 128-bit encryption
- Local or over-air configuration
- AT or API command set

- Project Execution Plan

  The execution plan is as follows:
  1. The prototype would be made and tested under conditions that may prevail in the car.
  2. The fabrication of the prototype onto the car would be discussed and then implemented
  3. The final product would then involve the real-time testing and proper checks

Tools and Components Content

List all the Parts to be used in the various subsystems of the proposed solution
For example:

Parts	Usage/Advantage
HRXL-MaxSonar-WR/WRC	To measure gear-oil tank level

Series– MB7389	
The level and temperature indicator sensors (as mentioned in the components description)	To measure temperature and the fuel level
Microcontroller-Mega 2560	To integrate sensors and communicate to the user
XBee Pro 60mW Wire Antenna - Series 1 (802.15.4)	For zigbee communication
Automotive Ultrasonic Fluid Level/Quality Measurement Reference Design TIDA-00322,TDC-1000	For measurement of the fuel level

Bill of Materials

Part	Function	Estimated Quantity	Estimated cost
HRXL-MaxSonar-WR/WRC **Series– MB7389**	To measure gear-oil tank level	1	**$109.95**
The level and temperature indicator sensors (as mentioned in the components description)	To measure temperature and the fuel level	1	**$300**
Microcontroller-Mega 2560	To integrate sensors and communicate to the user	1	**$35**
XBee Pro 60mW Wire Antenna - Series 1 (802.15.4)	For zigbee communication	1	**$38**

Automotive Ultrasonic Fluid Level/Quality Measurement Reference Design TIDA-00322,TDC-1000	For measurement of the fuel level	2	**Unknown**

Total Cost:
$485+TDC-1000

Links for components and tool samples to purchase

HRXL-MaxSonar- WR/WRC Series– MB7389 - maxbotix.com

The level and temperature indicator sensors -www.ktr.com (catalogue is provided)

XBee Pro 60mW Wire Antenna - Series 1 (802.15.4)-Sparkfun electronics site

TDC-1000- http://www.ti.com/tool/TIDA-00322?DCMP=ep-mcu-c2x-f2803xtidn-en&HQS=ep-mcu-c2x-f2803xtidn-em-lp-en&sp_rid_pod4=MTE1NzI3MTU0MjAzS0&sp_mid_pod4=48568670&detailID=59613634&spMailingID=48568670&spUserID=MTE1NzI3MTU0MjAzS0&spJobID=680139255&spReportId=NjgwMTM5MjU1S0#tiDevice

Conclusion

This project will make the cars more technologically developed . it will also enhance the users ability to take decisions such as fuel refill based on the data available.

List of supporting documents

KTR (company) Catalouge for sensors
Datasheet of the TDC-1000 board

Project Timeline

Tentative Timeline required for completion of the project.

Phases	Progress
Week 1	Making of easiest individual subsystem's and test it
Week 2	Make one complete subsystems
Week 3	Make the next subsystems
Week 4	Make the next subsystems
Week 5	Connect all of them and test the workability
Week 6	Take reading and check for performance improvement spots
Week 7	Demonstrate it to mentor and gets suggestions
Week 8-11	Fabrication of the components onto the car and final testing with mentor
Week 12	Final Submission