IPRO 311
CTA Wireless Information Network
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Overview

- Description
- Goals
- Achievements
- Difficulties
- Conclusion
Description

• Track vehicles real-time
• Implemented using GPS technology
• GPS data is transmitted using wireless technology to the internet
• Data is picked up by client applications
• Analyze data using Traffic Model
Essential Components

- **Hardware**
  - Garmin GPS Device
  - Laptop Computer
  - Wireless LAN Cards, HUB and Antenna

- **Software**
  - GPS Reader Software
  - GPS Thing – to map GPS information
Goals

• Upgrade GPS Software Interface
• Enable text messaging between vehicle and control center
• Troubleshoot Signal Shutdown Problem
• Rework output from traffic model
GPS Reader software

- Reads information from GPS device
- Creates server to transmit GPS data on the internet
- Multithreaded C-Windows programming using TCP/IP protocol
OLD APPLICATION

REDESIGNED

To Stop GPS Connection

Added Text

Send Message Box

Messages Sent / Recv

GPS Reader

OLD APPLICATION

REDESIGNED

GPS Reading Server

Select Com Port: Local IP

Start

Quit

Status:

COM1: selected
12.221.20.0
Serial port successfully opened.
Starting Server...
Status: Closed
Socket 144 created successfully.
Socket successfully bound.
Server listening for connection requests...

GPS Reading Server

Select Com Port: Local IP

Start

Stop

Exit

Status:

Please select a COM Port first.
COM1: selected
12.223.20.0
Serial port successfully opened.
Starting Server...
Status: Closed
Socket 144 created successfully.
Socket successfully bound.
Server listening for connection requests...
Connections: Closed successfully.

GPS Reader - IPRO 311 - FALL 2001

Data Version

GPS READER - IPRO 311 - FALL 2001

Data Version

Send Message to Client

Send Message
New Text Messaging Application

- Designed new messaging application using multi threaded C-Windows programming
- Synchronous Socket programming via TCP/IP protocol
- Text Communication between Control Center and Vehicle
Messaging Application

GPS Server - Vehicle

Vehicle IP Address
What is a Traffic Model?

- **Input**
  - Number of cars
  - Length of route (meter’s)
  - Time (seconds)

- **Computes**
  - Average velocity
  - Traffic density
  - Traffic flow

- **Output**
  - Produces an HTML file with results
  - Output table for desired street
Average velocity is computed using Length of the route and Time using the formula:

\[ \text{Average velocity} = \frac{\text{Length}}{\text{Time}} \]

Traffic density is computed using Number of cars and Length of the route using the formula:

\[ \text{Traffic Density} = \frac{\text{Number of cars}}{\text{Length}} \]

Traffic Flow is computed using Number of cars and Time using the formula:

\[ \text{Traffic Flow} = \frac{\text{Number of cars}}{\text{Time}} \]
Cars_In
Length_In (m)
Time_In (sec)

Valid_Numcars
&&
Valid_Length
&&
Valid_time

Traffic_Density = NumCars/length
Traffic_Flow = NumCars/Time
Average_Velocity = Length/Time

HTML_OUTPUT

END
## OUTPUT TABLE

<table>
<thead>
<tr>
<th>T(sec)</th>
<th>N(cars)</th>
<th>L(m)</th>
<th>V(m/sec)</th>
<th>TF(cars/sec)</th>
<th>TD(cars/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>10</td>
<td>1</td>
<td>10</td>
<td>0.1</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T(sec)</td>
<td>N(cars)</td>
<td>L(Km)</td>
<td>V(Km/h)</td>
<td>TF(cars/sec)</td>
<td>TD(cars/Km)</td>
</tr>
<tr>
<td>100</td>
<td>10</td>
<td>0.625</td>
<td>36</td>
<td>0.1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T(sec)</td>
<td>N(cars)</td>
<td>L(Miles)</td>
<td>V(Miles/h)</td>
<td>TF(cars/sec)</td>
<td>TD(cars/Miles)</td>
</tr>
<tr>
<td>100</td>
<td>10</td>
<td>1000</td>
<td>57.6</td>
<td>0.1</td>
<td>16</td>
</tr>
</tbody>
</table>
Poster

- Gathering Data
- Select Materials
- Outline / Layout
- Deadline
Ingredients for Success

- Team Contribution
- Time Management/Organization
- Weekly Team/Group meetings
- Commitment
- Hard Work
- Enthusiasm
IPRO Experience

- Develop Organization and Responsibility
- Define Goals
- Team Environment
- Leadership
- Out of class experience
Accomplishments

• GPS Reader redesigned
• New Text Messaging Application developed
• More precise inputs to Traffic Model
• Enhanced Output
Challenges

- Co-ordinate group meetings
- Evenly distribute work load
- Meeting Deadlines
- Signal loss - GPS device
- Real time input – Traffic Model
Recommendations

• Implement Asynchronous messaging
• Troubleshoot Signal loss problem
• Track more than one vehicle
• Implement traffic model to analyze real time data
• Three junior/senior level CS/CIS/CPE programmers
IPRO 311 Team