ILLINOIS INSTITUTE V OF TECHNOLOGY

IPRO 311 CTA Wireless Information Network Instructor: Prof. Thomas Wong www.iit.edu/~ipro-commet



- 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

<u>Software</u>

- GPS Reader Software
- GPS Thing to map GPS information





Illustration



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



REDESIGNED

OLD APPLICATION

GPS Reading Server	GPS Reading Server	Added Text
Select Com Port: Local IP Start COM1: Quit Status:	GPS READER - IPRO 311 - FALL 2001 <u>Start</u> Beta Version <u>Select Com Port:</u> Local IP <u>Stop</u>	→ To Stop GPS
CONT. selected 12.221.20.0 Serial port successfully opened. Starting Server Started up WinSock 2.0 Socket 144 created successfully. Socket succesfully binded. Server listening for connection requests	Status: Please select a COM Port first. COM1: selected 12.223.20.0 Serial port successfuly opened. Starting Server Started up WinSock 2.0 Socket 144 created successfuly. Socket succesfully binded. Server listening for connection requests Connections Closed successfully.	Connection
	Messages Sent and Received	
Send Message		
Box	Send Message to Client	
7.1	Send Message	Messages Sent / Recv

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

Message Send Message Connecting to Control CenterEstablishing ConnectionReceived Image: Connection Confirmation Sent: Hello Control Center Beceived: Control Center Received: How is the traffic down there today? Image: Control Center Sent: Expect 10 min delay! Image: Control Center Received: Copy that Image: Control Center Sent: Expect 10 min delay! Image: Control Center Received: Copy that Image: Control Center Received: Over and Out! Image: Control Center Shut Down Image: Control Center	216.47.131.134 Send Message	Connect to Server	Close Connection
Shut Down	Message Connecting to Control Cent Connection Confirmation. I Sent: Hello Control Center Received: How is the traffi Sent: Expect 10 min delay Received: Copy that Sent: Over Received: Over and Out	erEstablishing Connect	tionReceived
			Shut Down

<u>GPS</u> Server - Vehicle

GPS Reading Server	
GPS READER - IPRO 311 - FALL 2001 Beta Version	<u>Start</u>
Select Com Port: Local IP	Stop
Status:	<u> </u>
Please select a COM Port first. COM1: selected 148.217.20.0 Serial port successfully opened. Starting Server Started up WinSock 2.0 Socket 168 created successfully. Socket succesfully binded. Server listening for connection requests	 X
Messages Sent and Received	
Received : Hello Control Center Sent: How is the traffic down there today? Received : Expect 10 min delay Sent: Copy that Received : Over Sent: Over and Out	
Send Message to Client	
Start Messaging Server	end Message

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

FORMULAS USED

- Average velocity is computed using Length of the route and Time using the formula
 Average velocity = Length/ Time

 Traffic density is computed using Number of cars and Length of the route using the formula
 Traffic Density = Number of cars/ Length
- Traffic Flow is computed using Number of cars and Time using the formula

Traffic Flow = Number of cars/ Time



OUTPUT TABLE

T(sec)	N(cars)	L(m)	V(m/sec)	TF(cars/ sec)	TD(cars/m)
100	10	1	10	0.1	0.01
T(sec)	N(cars)	L(Km)	V(Km/h)	TF(cars/se c)	TD(cars/Km)
100	10	0.625	36	0.1	10
T(sec)	N(cars)	L(Miles)	V(Miles/h)	TF(cars/ sec)	TD(cars/ Miles)
100	10	1000	57.6	0.1	16



- 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

<u>Accomplishments</u>

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

<u>Challenges</u>

- 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

