Agenda

1. Introduction & Overview
2. Project Requirements
3. Law Enforcement, Settings Modules
4. UI
5. Conclusion
What is EcoCAR3?

- 4-year competition that challenges 16 universities across the country to redesign a Camaro to reduce its environmental impact.

- Teams apply the latest cutting-edge technologies and incorporate new innovative ideas.

- Police vehicle
Project Technologies

- **Programming Framework** - Qt is a cross-platform application framework that uses standard C++. It’s used for developing application software that contain GUI’s.

- **Hardware** - Standalone board connected to a touchscreen display.

- **CAN Signals** - Signals (composed of bytes of data) sent to systems in the car that will control their operation or receive information on the car (a/c, temperature, battery level, etc.)
Project Technologies

ArcGIS
- Geographic information system data
- Will display this data on a map as a navigation system
- Routing around closures and events in real time
  - Trains, construction, etc
- Implemented by another team
Project Challenges

- **Inexperienced Liaison** - 1st year as a liaison for our team; learning process

- **Receiving requirements** - Difficulty communicating what we can/cannot do

- **No available touchscreen display** - Board needed to be replaced; delayed progress, uncertainty

- **Working with QT** - Frequent crashes and re-installing
2 Project Requirements

By Abhishek Patel
Project Requirements

- Build a touchscreen GUI that will replace most physical buttons in the car
- Build a simulated police database
- Integrate ArcGIS navigation software when completed
- Integrate CAN signal controls when completed
EcoCar3

2.1 Data and Communications Module (DCM)
2.2 Law Enforcement Module (LEM)
2.3 Navigation Module (NM)
2.4 User Interface Module (UIM)
2.5 Settings Module (SM)

User

Touchscreen Input

CAN BUS

CAN Signals

Display

Updated Display Information
DFD 1

- **User**
  - Touchscreen Input
  - 2.4 User Interface Module
  - Information and Diagnostics
- **Display**
- **Car**
  - Control Instruction
  - Car Information
- **CAN Bus**
  - CAN commands
  - Updated Car Information
- **Internet**
  - Navigation Commands
  - CAN commands
- **2.3 Navigation Module**
- **2.4 User Interface Module**
- **2.5 Settings Module**
- **2.2 Law Enforcement Module**
- **Police Database**
  - Police Information
Transfer of Knowledge

- **GitLab** - All of the code will be saved here.
- **Google Groups** - All of the documentation is shared on here.
- **Liaison** - Shares knowledge/experience with the future team (Year 4)
Police Database

By Vincent Luu
POLICE MOBILE COMPUTERS

- Simulate mobile computers used by police
  - track license plates, cross reference databases, check felonies
# POLICE MOBILE COMPUTERS

## PERSON TABLE

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL #</td>
<td>String (DMV driver’s license number)</td>
</tr>
<tr>
<td>FNAME</td>
<td>String</td>
</tr>
<tr>
<td>LNAME</td>
<td>String</td>
</tr>
<tr>
<td>ADDR</td>
<td>String (Street Address)</td>
</tr>
<tr>
<td>SEX</td>
<td>String (gender)</td>
</tr>
<tr>
<td>EYES</td>
<td>String (eye color)</td>
</tr>
<tr>
<td>HAIR</td>
<td>String (hair color)</td>
</tr>
<tr>
<td>HGT</td>
<td>INT (Height of person in cm.)</td>
</tr>
<tr>
<td>WGT</td>
<td>INT (Weight of person in lbs.)</td>
</tr>
</tbody>
</table>
## POLICE MOBILE COMPUTERS

<table>
<thead>
<tr>
<th>CAR TABLE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L. PLATE #</strong></td>
<td>String (license plate number)</td>
</tr>
<tr>
<td><strong>STATE</strong></td>
<td>String</td>
</tr>
<tr>
<td><strong>VIN #</strong></td>
<td>String (car’s VIN number)</td>
</tr>
<tr>
<td><strong>MAKE</strong></td>
<td>String (Car Make)</td>
</tr>
<tr>
<td><strong>MODEL</strong></td>
<td>String (Car Model)</td>
</tr>
<tr>
<td><strong>YEAR</strong></td>
<td>INT (Car Year)</td>
</tr>
<tr>
<td><strong>OID</strong></td>
<td>String (owner id, references PERSON table DL # attribute)</td>
</tr>
<tr>
<td><strong>REPORTED STOLEN?</strong></td>
<td>Boolean</td>
</tr>
</tbody>
</table>
## WARRANT TABLE

<table>
<thead>
<tr>
<th><strong>PID #</strong></th>
<th>String (person ID, references PERSON table DL # attribute)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WID</strong></td>
<td>INT (if 0, person has no criminal record: CRIME TYPE and RISK LEVEL null. If 1, person has a criminal record: CRIME TYPE and RISK LEVEL are not null)</td>
</tr>
<tr>
<td><strong>CRIME TYPE</strong></td>
<td>String (type of crime committed)</td>
</tr>
<tr>
<td><strong>RISK LEVEL</strong></td>
<td>INT (range from 0-10 in severity of crime)</td>
</tr>
</tbody>
</table>
Settings Module
4 UI Design

By Mason Nguyen
UI Design Considerations

- Need to consider usability
- Will be operated by someone on driver side of vehicle
- Layout needs to be designed with function over style in mind
  - Readable
  - “Eyeball-able”
Usability Ideas

- Buttons should be vertically stacked on the driver side of the screen
- Buttons should be large, and easy to press without misclicking
- Tasks should be accomplished with few screen transitions
- Test runs with unfamiliar users to test ease of use
Readability

- Low visual noise overall
  - No distracting graphics or effects
- High contrast colors
  - Possible color coding
- Recognize UI elements with peripheral vision
  - Minimize amount of time spent searching for controls
Current Appearance

- Buttons require reaching
- Graphics not needed (we want Windows 10-like)
- Wasted empty space, buttons could be larger
- Button icons needlessly flashy
- Functions of buttons not immediately clear for unfamiliar users
Conclusion
Fall Accomplishments

- Introduction to EcoCar3 members and goals
- Discussion and finalization of requirements
- Reproduced and studied last year’s progress
- Familiarized with Qt IDE
Timeline

UI + Database Redesign
Winter vacation - First half of Spring semester

Integration of ArcGIS, car controls
Throughout Spring semester

In-car Testing
Second half of Spring Semester.