

bikeNavi

HCI Seminar: Physical Computing
Summer term 2014

Group 1:

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Agenda

- Ideation workshop
- Workflow
- Open problems
- Future work
- Distribution of work
- Demo

IDEATION WORKSHOP

Domain: Traffic

- Navigate through crowded streets or in a new area
- Find alternative path while driving
- Distraction while driving to look at display



Inspiration Cards

Traffic



Situation:
Most people are traveling (almost) everyday, they go by car, bus, bicycle, ...

Target Group:
Everyone traveling in some way

Setting:
Crowded city streets, or even small country tracks

Themes:
Navigation
Communication
Speed?
Automation of steps
Control of e.g. in car devices

Domain card

Traffic jam



Situation:
A number of cars each other and no move or only slow

Target Group:
Driver of cars a forbilities are ad

Setting:
a highway, in t traffic times.

Red pedestrian light



Situation:
A person wants to walk over a street and has to wait for the lights to turn green

Target Group:
Pedestrians

Setting:
City traffic, Pedestrian lights with long red phase

Themes:
Games to motivate pedestrians to wait at the red phase
Show News
Show statistics about the number of pedestrians who already passed the lights.
Show remaining waiting time

Communication



Situation:
People or transport vehicles like to establish a communication while or before getting in traffic (person to person, person to vehicle or vehicle to vehicle is possible)

Target Group:
People who like communicate with their vehicle (rather while in traffic, disable emergency sig

Setting:
Outside in some scenario, also in people on a ve

Themes:
Chats
Transfer of Signals (e.g. emergency

Navigation



Situation:
One or multiple people try to navigate somewhere in traffic

Target Group:
Especially people driving a motorcycle or bicycle are interesting, since they cannot use their hands while navigating for input as easy as car drivers. But of course also cars are concerned. Others are e.g. inline skaters, wheelchair users, or just walking people.

Setting:
Mostly outside on streets (but also indoor navigation is possible.)

Themes:
Give a way overview
Help to find the way
Share problems occurring on the way
Virtual reality?!

Sub-domain cards

Control car using voice command

Streetpong



Keywords:
LED, Traffic, Navigation, GPS

Input:
Geo

Output:
LED Projection

Technology:
probably Arduino

hammerhead - follow the lights



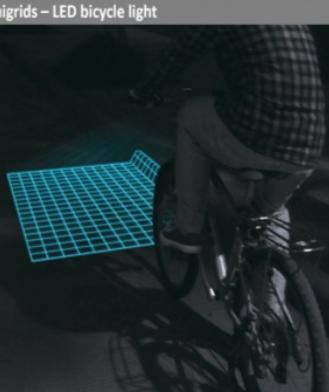
Keywords:
LED, Traffic, Navigation, GPS

Input:
Geo

Output:
LED Projection

Technology:
probably Arduino

Lumigrids - LED bicycle light



Keywords:
LED, Traffic

Input:

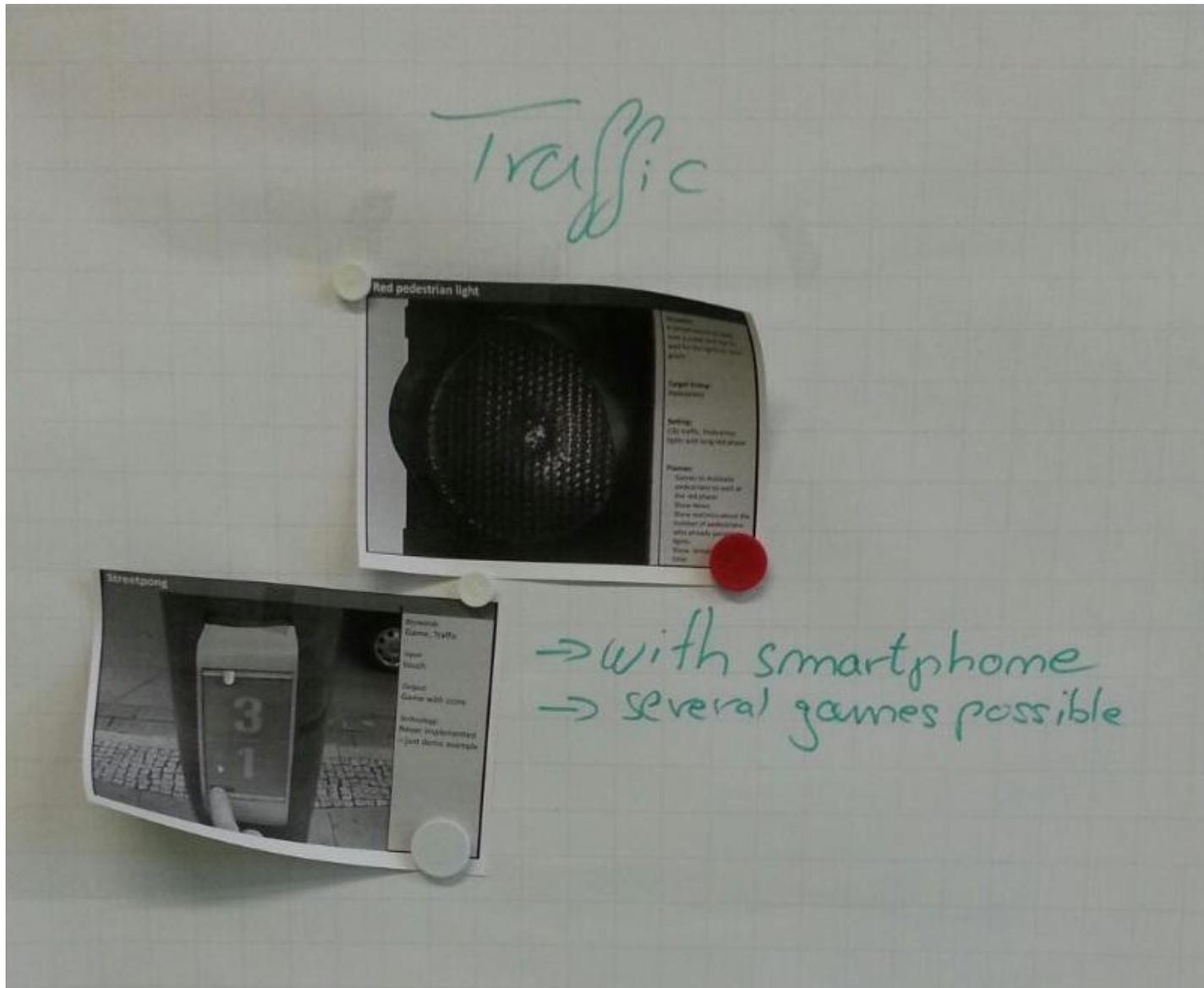
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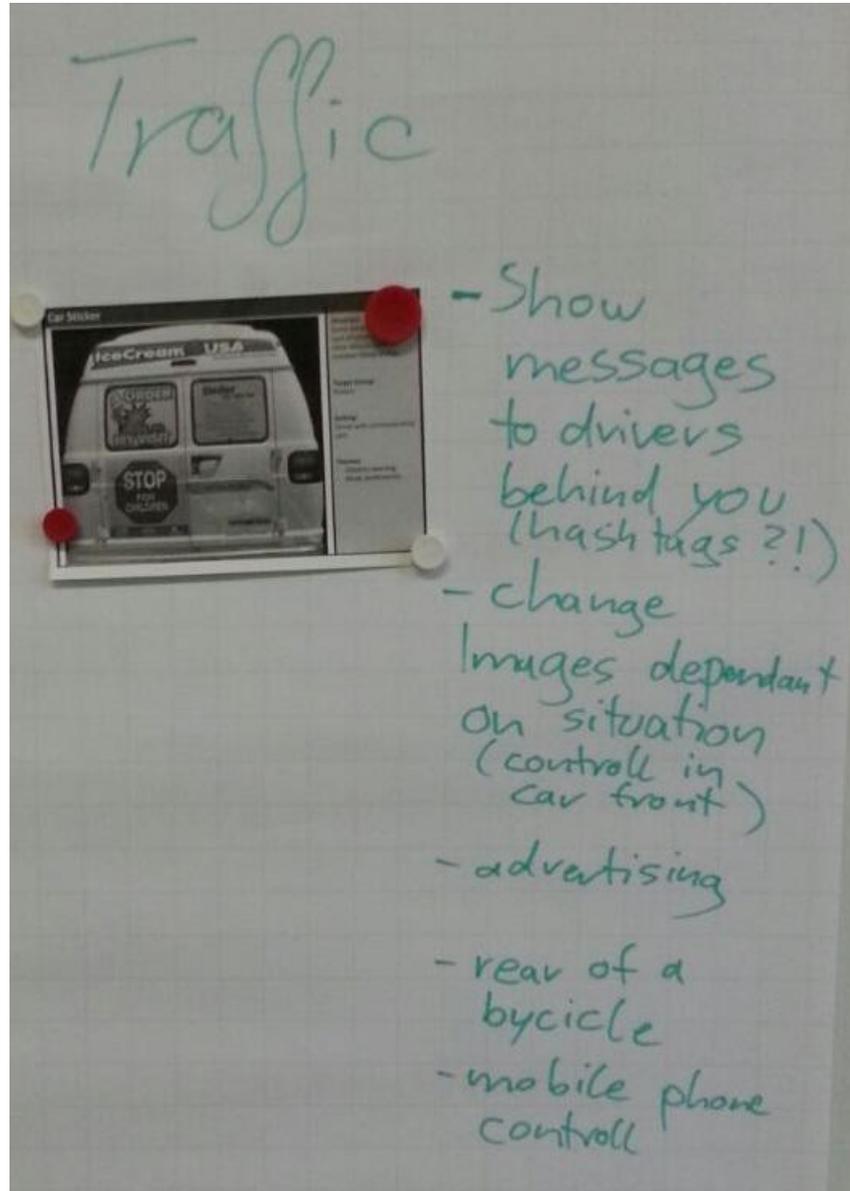
Technology cards

OUR IDEAS

Traffic Light Game

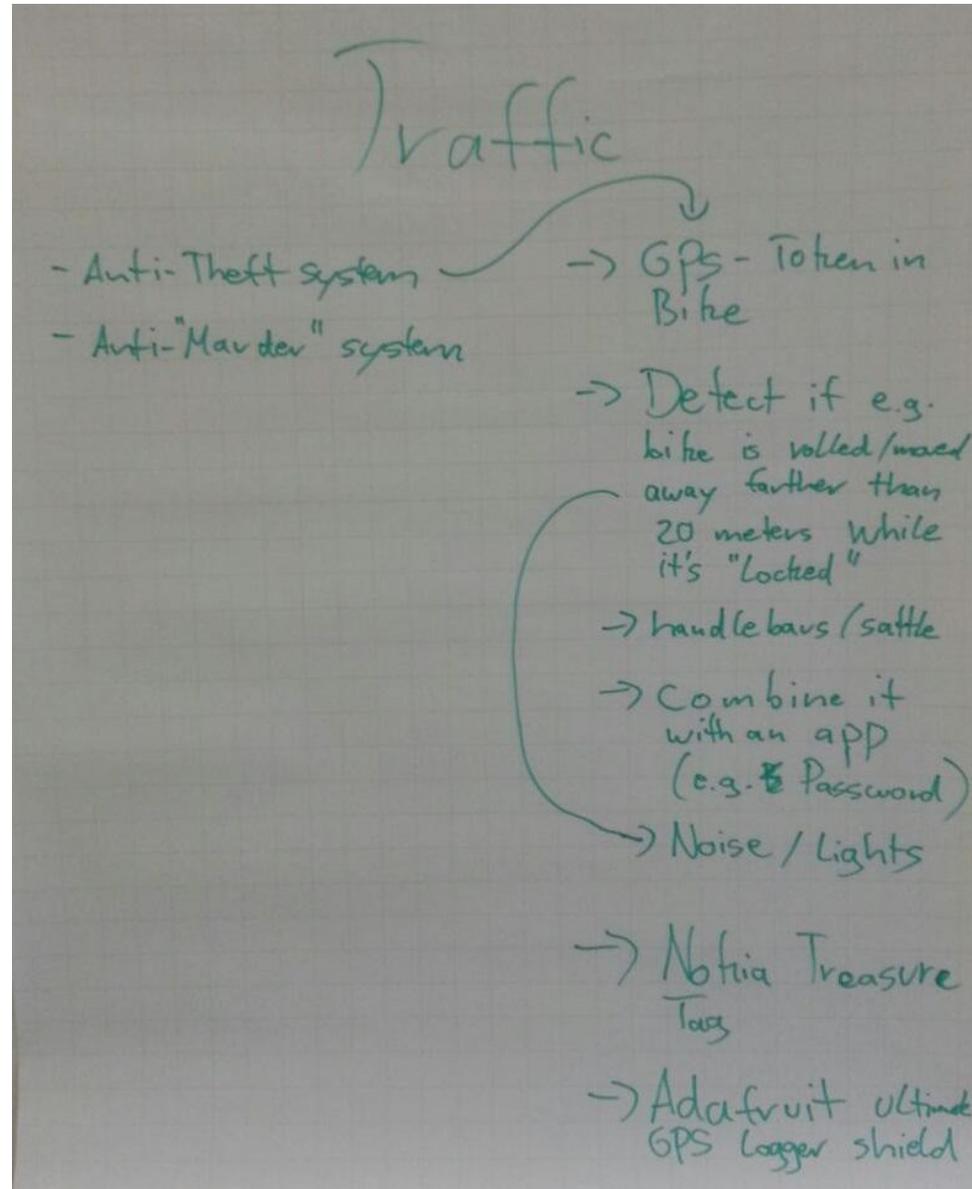


Car Message Board



Bicycle Navi with Vibration





Our Favorite Idea

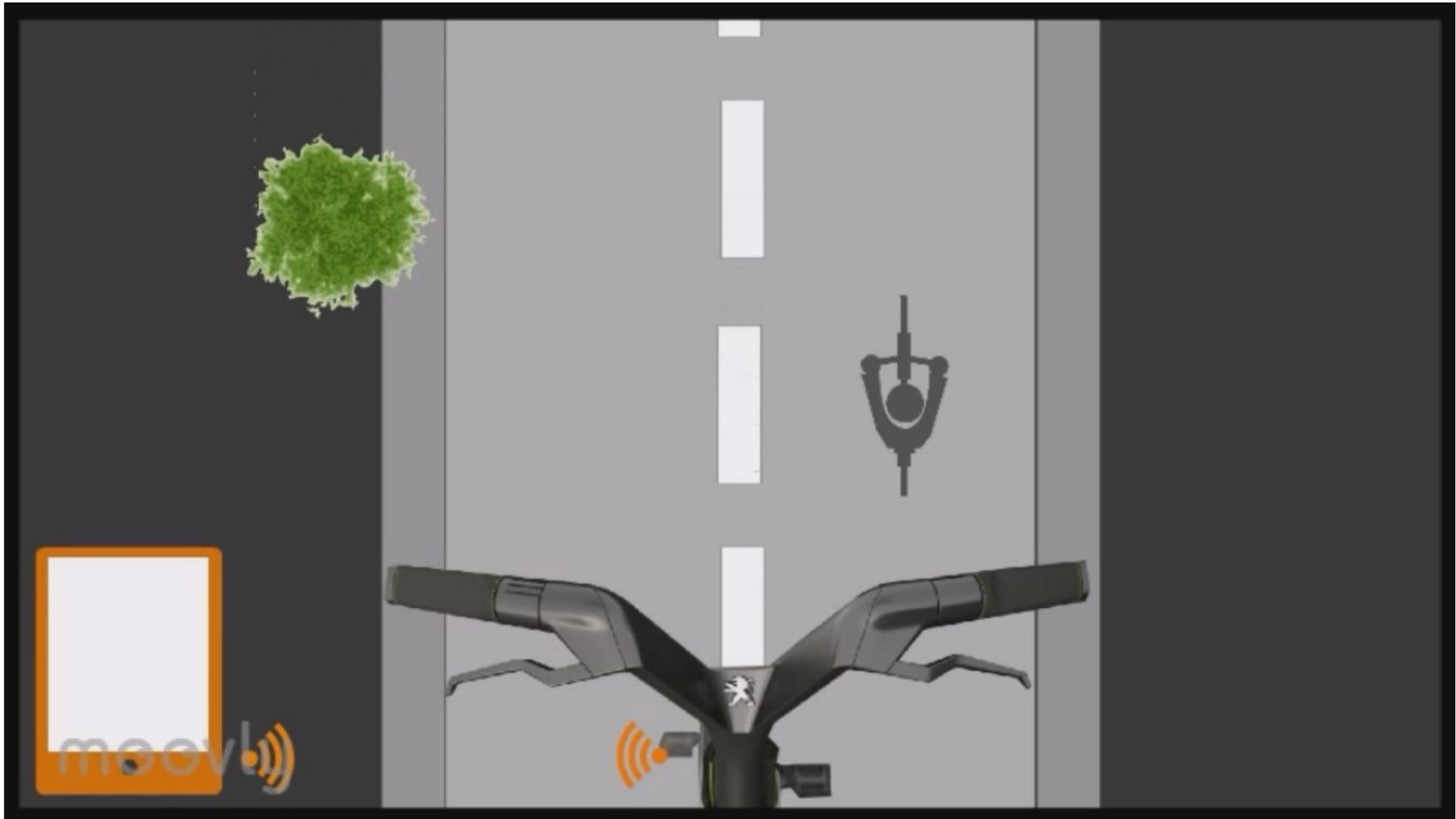
- **Bicycle Navigation with Vibration**

Because...

- ✓ It's **most innovative**
 - ✓ **No distraction** (no need to glance on display)
 - ✓ **No noise interference** (problem with audio navigation)
 - ✓ It **helps people** to navigate in unknown areas
- ➔ Biggest **potential** for a commercial project!

WORKFLOW

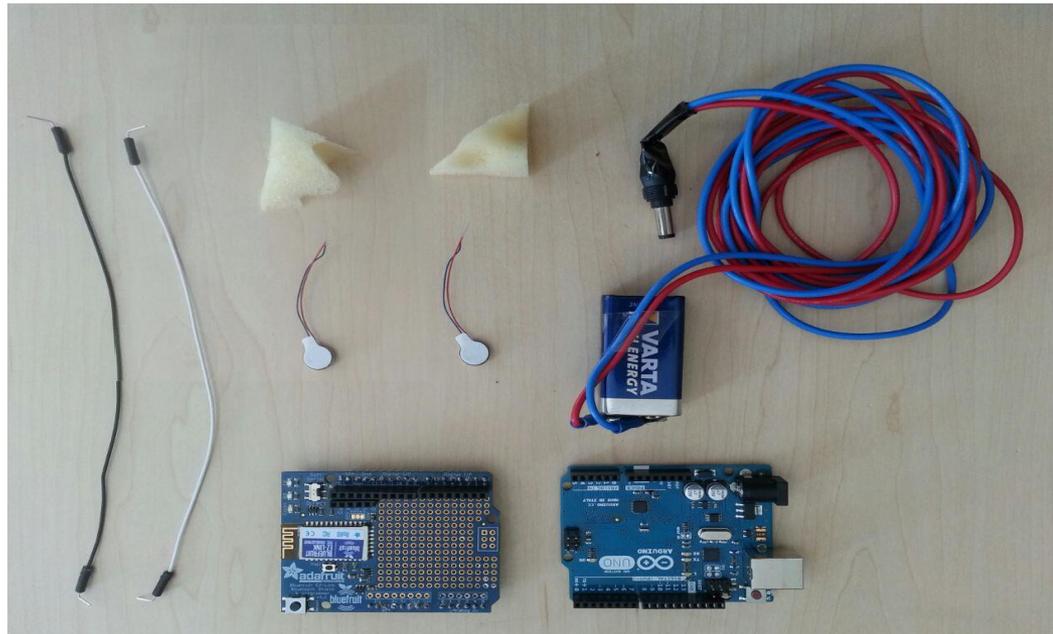
Step 1: Design



Step 2: Hard-/ Software

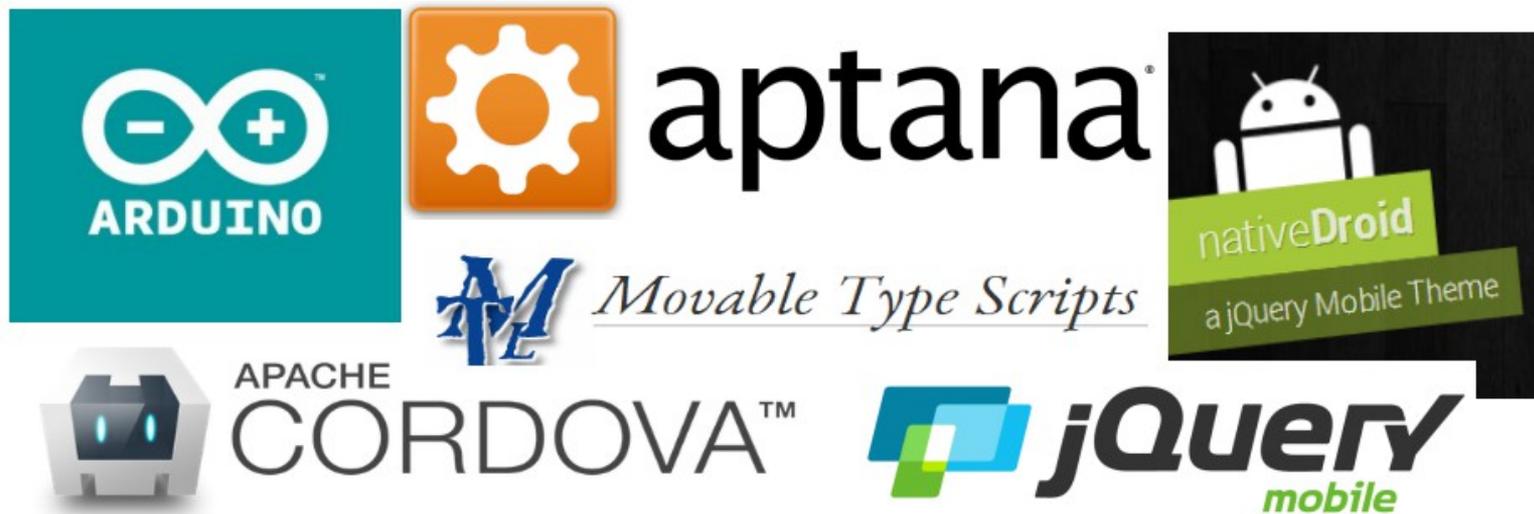
- **Hardware**

- Arduino Uno
- Bluefruit EZ-Link Shield - Bluetooth Arduino Serial & Programmer
- Two compact vibration motors
- Battery (9V)
- Wires
- Android smartphone (4.3+)



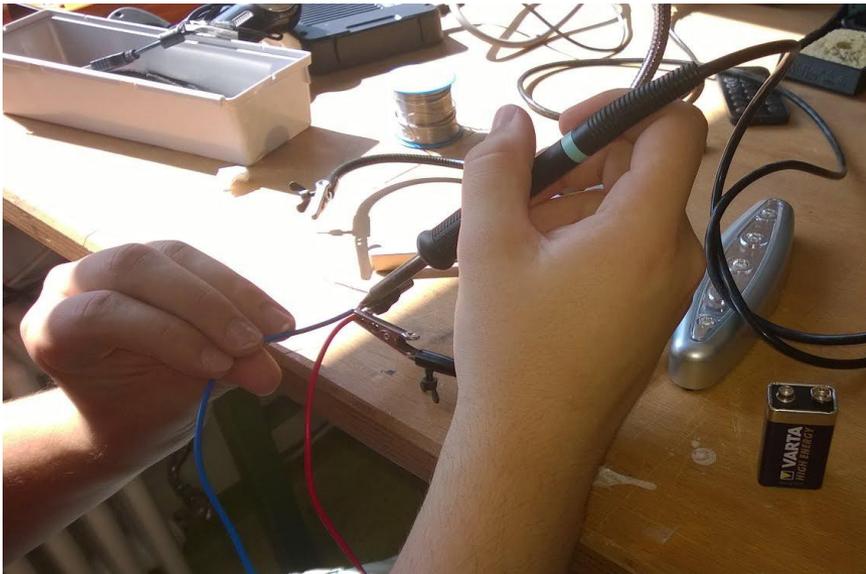
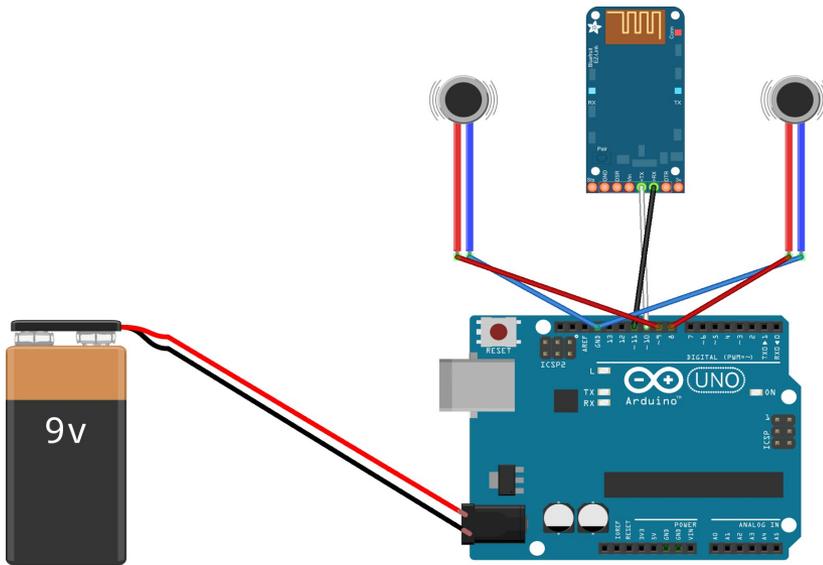
Step 2: Hard-/ Software

- **Software and Programming libraries**
 - Arduino Software
 - Aptana IDE
 - Cordova framework
 - JQuery Mobile
 - Native droid (User interface design)
 - Movable type scripts (GPS calculations)



Step 3: Soldering & Wiring

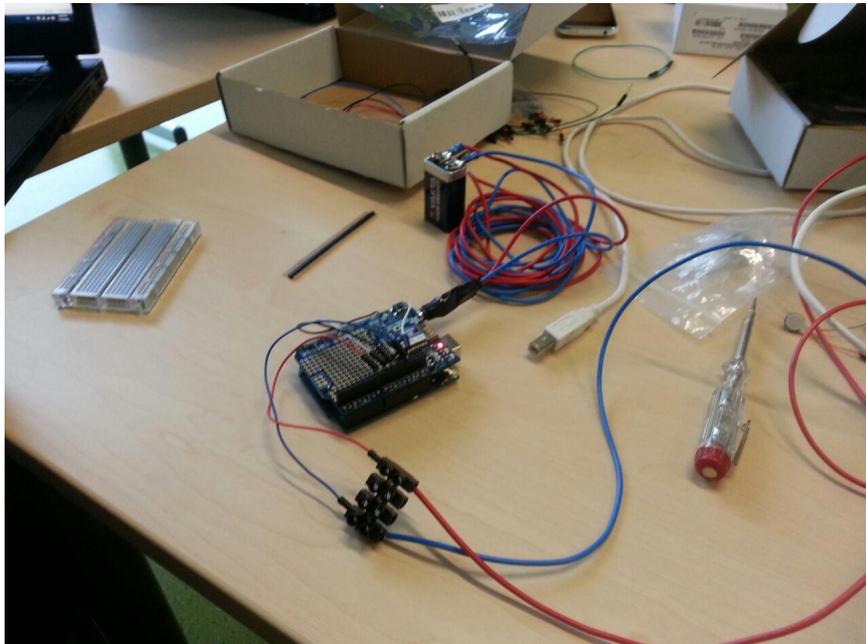
- Attachment Battery
- Attachment vibration sensors



Step 4 Part I: Arduino



- Generation of vibrations
- Based on the inputs from GPS



Step 4 Part II: Android

```
52 // disconnect on the first nav bar button, because the api sucks
53 $(document).on("click", "#connect"), function(event) {
54   event.preventDefault();
55   // unmark the button
56   $(this).removeClass("ui-btn-active");
57
58   if (window.confirm("disconnect?")) {
59     bluetoothSerial.disconnect();
60     $(body).pagecontainer("change", "#connect", {});
61   }
62   return false;
63 };
64
65
66
67 $(document).on("click", "#controllerButtons", function(event) {
68   event.preventDefault();
69   // unmark the button
70   $(this).removeClass("ui-btn-active");
71   //bluetoothSerial.write(data, success, failure);
72
73   switch (this.getAttribute("value")) {
74     case "left100":
75       app.goLeft("100");
76       break;
77   }
78 });
```

Console: [propertyfile] Updating property file: /Applications/XAMPP/xampfiles/htdocs/ori/androidclient/platforms/android/ant-build/build.prop
[propertyfile] Updating property file: /Applications/XAMPP/xampfiles/htdocs/ori/androidclient/platforms/android/ant-build/build.prop
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post-build:
[move] Moving 1 file to /Applications/XAMPP/xampfiles/htdocs/ori/androidclient/platforms/android/ant-build
[move] Moving 1 file to /Applications/XAMPP/xampfiles/htdocs/ori/androidclient/platforms/android/CordovaLib/ant-build

debug:
BUILD SUCCESSFUL
Total time: 5 seconds
3443 KB/s (5802922 bytes in 1.424s)
pkg: /data/local/tmp/bikeNav-debug.apk
Success
!t-kr:androidclient bkr\$

- Setup Cordova
- Access smartphone bluetooth interface
- Access smartphone's geolocation data
- Send commands via Bluetooth
- Native Droid (user interface)

Navigation
Start a fixed path to demonstrate it live

START TRACKING

Discon... Direct... Naviga... GPS

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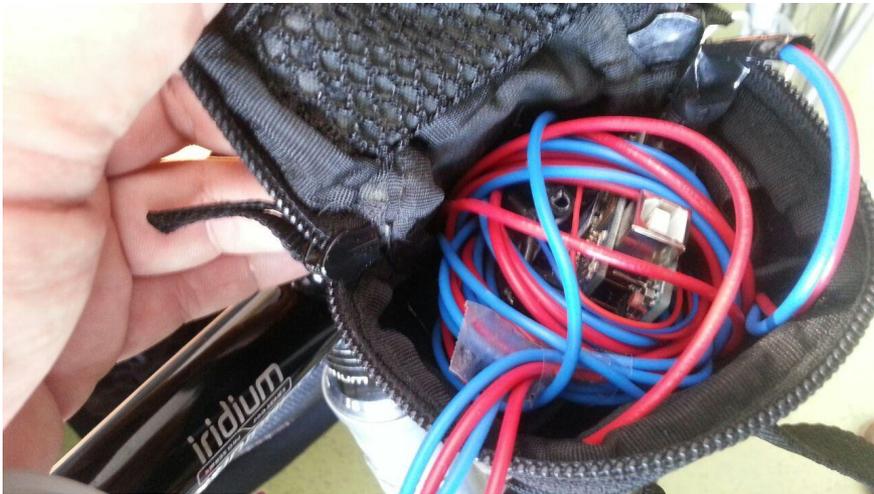
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pkg: /data/local/tmp/bikeNav-debug.apk
Success
!t-kr:androidclient bkr\$

Step 5: Integration



- Mount the vibration motors
- Mount the Arduino on a bicycle
- Fixate cables
- Test the whole system



Step 6: Enjoy the ride!



OPEN PROBLEMS

Open Problems

- Hardware problems
 - Weak intensity of vibration motors
 - Unplug BT shield for every upload
- Software problems
 - Inaccuracy of GPS, when using Cordova framework
 - Layout issues for android user interface
 - Google map API complex to implement

FUTURE WORK

Future Work

- Use stronger vibration motors
- Use Google API
- Try out external GPS device

DISTRIBUTION OF WORK

Distribution of work

- Arduino development
 - Alexander Schönhals
 - Shraddha Kulkarni
 - Maximilian Dürr
- Android Development
 - Benedikt Kromer
 - Thomas Griesshaber
 - Mohammad Haque
- Documentation
 - Maximilian Dürr
 - Shraddha Kulkarni

THANK YOU FOR YOUR ATTENTION



LET'S RIDE A BIKE!