Commuter Tracking Sensor Network

Weekly Report - November 9, 2014

Team Members:

Alex Sarra (ags7798@rit.edu)

Seth Hendrick (srh7240@rit.edu)

Jared Mistretta (jxm6666@rit.edu)

***Other Collaborators*:**

Professor Wagner (mjwgse@rit.edu) (585) 475-5289

Nicholas Conn (nxc9827@rit.edu) - Graduate Student

Jared Stroud (jaredestroud@gmail.com) - Security Major

Stanley Chan (sxc4244@rit.edu) - Security Major

Project Website:

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Updated Milestone Chart

Milestone	Team Member in Charge	Modified Completion Date	Original Completion Date	Comments
1. Contact Monroe County **Discuss deployment options for sensor nodes.**	Jared	11/11/2014	10/27/2014	Pushed it back to deployment approach time.
2. Networking Architecture Configuration and Testing		10/13/2014	6/15/2014	
2.1 Configure XBees for DigiMesh and have them communicating in close proximity	Seth, Jared	10/16/2014	6/1/2014	Done for now. Some additional configuration changes might need to be updated as more testing is done.
2.2 Range Test	Seth, Jared	11/10/2014	6/9/2014	Will be completed Monday or Wednesday. Rained out, and pushed back.
2.3 Small-scale trail deployment	Seth, Jared	11/14/2014	6/15/2014	Dependent on 2.1 and 2.2 and 5.2
3. Windbelt power module design		10/2/2014	6/18/2014	

3.1 Breadboard prototyping	Alex, Jared	11/12/2014	6/1/2014	Secondary Boost Converter has been determined inadequate for our power needs. An EVM for the secondary boost converter will need to be ordered soon to prototype with. Buck converter is pushing enough current for low power mode on the radio modules. To remedy this, we will need higher-power inductors, which will be picked up soon to prototype with. The coilcraft ones on the PCB that was ordered will most-certainly be able to transfer enough power through the BQ module.
3.2 PCB design	Alex	11/12/2014	6/10/2014	COMPLETE (for now). The PCB design version 1 is complete and ordered. Continuing development with a version two that will allow us to slightly change the resistor dividers for OV and UV networks. For now, this is complete.
3.3 Ship design for stamping	Alex	11/5/2014	6/18/2014	COMPLETE First iteration of design is ordered. Parts for the board are known, and will be ordered within the weekend.

3.4 Spice Transient Analysis	Alex, Jared	10/20/2014	9/22/2014	COMPLETE Transient analysis is complete for both the buck and secondary boost converter. Levels are attainable for both the 6-10V unregulated (Pixy) and 3-3.3V regulated (XBee) ranges per transient simulations produced by TI's WEBDESIGN application.
4. Windbelt power module construction and testing		10/22/2014	6/30/2014	
4.1 Solder on components	Alex	11/21/2014	6/29/2014	The PCB will be back by the 18th, which will give us enough time to solder on components.
4.2 Continuity tests	Alex	11/24/2014	6/30/2014	Dependent on 4.1, which should be met in time.
5. Server/Gateway setup	Seth	10/10/2014	7/1/2014	The server is a Raspberry Pi located at ctsn.student.rit.edu.
5.1 Install software (Django, Apache, etc.)	Seth	6/21/2014	6/17/2014	COMPLETE Apache, Django, MariaDB are installed and ready to go.
5.2 Interface XBee with Pi	Seth	10/31/2014	7/1/2014	COMPLETE Are able to Tx and Rx with the XBees between two pis.
5.3 Install and configure fail2ban	Seth	9/1/2014	6/21/2014	COMPLETE

6. Server/Gateway testing		10/12/2014	7/1/2014	COMPLETE
6.1 Disable root login test	Seth	6/21/2014	6/16/2014	COMPLETE Done automatically when Raspbian was updated
6.2 Set the SSH port to a non-standard port test	Seth	6/21/2014	6/17/2014	COMPLETE SSH Port is set to 1315, not the default port of 22
6.3 Disable password login test - must log in with SSH key	Alex, Jared, Seth	9/5/2014	6/21/2014	COMPLETE SSH Keys are required to login to the server via SSH
6.4 White Hat Hacker Test	Seth	10/12/2014	6/21/2014	COMPLETE. They could not access the server via ssh, get a root shell, or access the database directly. Jared (security major) will be providing a formal report of the pen test results. We will be able to fortify security based on the results.
6.5 Ping disabled test	Seth, Security Majors	10/31/2014	6/21/2014	DEFERRED While the server is on the RIT campus, this is completed since outsiders can not ping rit.edu. If the server moves off campus for whatever reason, this will need to be revisited
7. Sensor hardware testing and integration		10/31/2014	7/11/2014	

7.1 Begin playing with Pixy Cam in USB tethered mode	Jared, Alex, Seth	7/11/2014	5/1/2014	COMPLETE We've all experimented and interfaced with the PixyCam now, and familiarized ourselves with its basic operation.
7.2 Interface Pixy Cam with an XBee	Seth	11/14/2014	6/22/2014	Now that the "algorithm" is figured out after doing 5.2, this shouldn't take too long to plug into the Pixy Cam's firmware
7.3 Integrate with existing power module	Jared, Alex	11/12/2014	7/11/2014	Dependent on 3.1 and ordering and testing the EVM for the secondary boost converter.
8. Sensor Enclosure Design / Testing		11/14/2014	8/7/2014	
8.1 Use CAD tools to design sensor enclosure	Jared	11/14/2014	7/1/2014	This is no longer blocked. This process can continue taking into account the largest board size available through the evaluation version of EAGLE. Jared currently working on CV, which is a higher priority task.
8.2 Use 3D printer to print the enclosures	Jared	11/14/2014	7/15/2014	8.1 Must be done first
8.3 Test (See Gantt Chart)	Jared	11/14/2014	8/7/2014	Dependent on 8.2

9. Windbelt Testing (See Gantt Chart)	Alex	11/11/2014	5/27/2014	This can be completed at any point. Most likely, enough bandwidth will be available early this week. Up to now, a waveform generator that can provide the same Vave AC and the same frequency has been utilized.
10. Sensor Software - Identify targets		10/24/2014	9/1/2014	
10.1 Code Review for Pixy Software	Alex, Seth, Jared	9/8/2014	9/8/2014	COMPLETE Code review was completed. Information was documented regarding each file's contents.
10.2 Compile GCC version of Pixy software and note differences			9/8/2014	No longer a requirement. Keil will work just fine.
10.3 Train camera for identifying walkers, bikers, and horses	Jared	11/14/2014	8/1/2014	Attempting to get LibCCV compiling for the Pixy Cam. At the moment, it compiles, but it is having trouble linking in.
10.4 Train camera to figure out what direction the target is going	Jared	11/14/2014	9/1/2014	10.3 and 10.4 are not dependent on one another. These two tasks should be completed in parallel.
11. Database Creation		9/23/2014	9/14/2014	COMPLETE

11.1 Create mysql or mariadb database so data from trail can be saved to it	Seth	11/5/2014	9/5/2014	COMPLETE
12. Website Creation		9/26/2014	9/28/2014	COMPLETE. Final website is located at https://ctsn.student.rit.edu
12.1 Create status webpage, hosted somewhere else	Seth	9/5/2014	9/5/2014	COMPLETE Status webpage that pings the gateway is functional. Its currently hosted on one of Seth's pis, located at http://people.rit.edu/~srh7240/ctsn_status .
12.2 Create web front end	Seth, Alex	10/31/2014	9/14/2014	Front end is COMPLETE. Data results from the CV algorithms must be identified and linked to the database to render on the webpage.
12.3 Link website to database	Seth	11/5/2014	9/21/2014	COMPLETE Website now no longer uses hardcoded values to display results.
13. Website Testing (See Gantt Chart)	Team	10/12/2014	10/4/2014	COMPLETE. Jared (security major) will be providing a formal report of the pen test results. We will be able to fortify security based on the results.
14. Target Data Communication		11/21/2014	10/5/2014	

14.1 Sensors communicate target data with each other	Seth, Alex	11/21/2014	10/4/2014	Dependent on 7.2
14.2 Sensors can communicate and write target data to database	Seth	11/21/2014	10/5/2014	Gateway side is done. Only need to do the Pixy Cam side.
15. Computer Vision Testing (See Gantt Chart)	Alex, Seth	11/1/2014	10/28/2014	Dependent on 10.3 and 10.4
16. Deployment		11/17/2014	11/9/2014	
16.1 Deploy nodes on trail	Team	11/21/2014	11/5/2014	
16.2 Activate website	Team	9/27/2014	11/9/2014	Complete. Website is located at http://ctsn.student.rit.edu (login required)
17.Integration Testing		11/13/2014		
17.1 Advanced II integration testing with focus on single node in controlled environment	Team	11/14/2014		Some of the integration testing will need to be completed with the prototype in place due to time constraints. Date adjusted due to change in prototyping timeframe.

17.2 Advanced II integration testing with focus on single node in an outdoor environment	Team	11/19/2014		Some of the integration testing will need to be completed with the prototype in place due to time constraints. Date adjusted due to change in prototyping timeframe.
17.3 Advanced II testing with focus on operation in outdoor environment for multiple nodes	Team	11/21/2014		Some of the integration testing will need to be completed with the prototype in place due to time constraints. Date adjusted due to change in prototyping timeframe.

Current Milestones

Milestone	Team Member in Charge	Modified Completion Date	Original Completion Date	Comments
3.1 Breadboard prototyping	Alex, Jared	11/12/2014	6/1/2014	Secondary Boost Converter has been determined inadequate for our power needs. An EVM for the secondary boost converter will need to be ordered soon to prototype with. Buck converter is pushing enough current for low power mode on the radio modules. To remedy this, we will need higher-power inductors, which will be picked up soon to prototype with. The coilcraft ones on the PCB that was ordered will most-certainly be able to transfer enough power through the BQ module.
3.2 PCB design	Alex	11/12/2014	6/10/2014	COMPLETE (for now). The PCB design version 1 is complete and ordered. Continuing development with a version two that will allow us to slightly change the resistor dividers for OV and UV networks. For now, this is complete.

3.3 Ship design for stamping	Alex	11/5/2014	6/18/2014	COMPLETE First iteration of design is ordered. Parts for the board are known, and will be ordered within the weekend.
10.3 Train camera for identifying walkers, bikers, and horses	Jared	11/14/2014	8/1/2014	Attempting to get LibCCV compiling for the Pixy Cam. At the moment, it compiles, but it is having trouble linking in.
10.4 Train camera to figure out what direction the target is going	Jared	11/14/2014	9/1/2014	10.3 and 10.4 are not dependent on one another. These two tasks should be completed in parallel.
11.1 Create mysql or mariadb database so data from trail can be saved to it	Seth	11/5/2014	9/5/2014	COMPLETE
12.3 Link website to database	Seth	11/5/2014	9/21/2014	COMPLETE Website now no longer uses hardcoded values to display results.
14.2 Sensors can communicate and write target data to database	Seth	11/21/2014	10/5/2014	Gateway side is done. Only need to do the Pixy Cam side.

Next Milestones

2.2 Range Test	Seth, Jared	11/10/2014	6/9/2014	Will be completed Monday or Wednesday. Rained out, and pushed back.
2.3 Small-scale trail deployment	Seth, Jared	11/14/2014	6/15/2014	Dependent on 2.1 and 2.2 and 5.2
3.1 Breadboard prototyping	Alex, Jared	11/12/2014	6/1/2014	Secondary Boost Converter has been determined inadequate for our power needs. An EVM for the secondary boost converter will need to be ordered soon to prototype with. Buck converter is pushing enough current for low power mode on the radio modules. To remedy this, we will need higher-power inductors, which will be picked up soon to prototype with. The coilcraft ones on the PCB that was ordered will most-certainly be able to transfer enough power through the BQ module.
10.3 Train camera for identifying walkers, bikers, and horses	Jared	11/14/2014	8/1/2014	Attempting to get LibCCV compiling for the Pixy Cam. At the moment, it compiles, but it is having trouble linking in.
10.4 Train camera to figure out what direction the target is going	Jared	11/14/2014	9/1/2014	10.3 and 10.4 are not dependent on one another. These two tasks should be completed in parallel.

17.1 Advanced II integration testing with focus on single node in controlled environment	Team	11/14/2014		Some of the integration testing will need to be completed with the prototype in place due to time constraints. Date adjusted due to change in prototyping timeframe.

Status

Difficulties

Getting libccv to compile for the pixy cam is very difficult. We were able to compile libccv to a static library, but Keil is apparently not smart enough to link it in (nor does it provide an easy way to do it). We might consider trying a makefile or an SConstruct.

The EAGLE components for the Coilcraft inductor and TI BQ25504 caused DRC errors in the schematic, due to OSH Parks fabrication limitations. These DRC errors were false positives, and were ignored.

Surprises

Cam files were very easy to create once the PCB design was complete. As easy as pressing a button. Also, since OSH Park does not require the use of CAM files, they were made simply to be able to inspect the completed board prior to design submission.

Successes

Website now uses https, so it is more secure than it was before. It will also lock out users who fail to login after 5 attempts, and has a captcha to prevent brute forcing. The website will pop-up an “unsecure connection” warning, but thats only because we self-signed our ssl certificate since a “real” one isn’t cheap.

The gateway now has code that will take in commands from the trail nodes, and execute them. This means that right now, we can send data from a trail node, to the gateway, to the database, and finally to the website. This was done between two Raspberry Pis. The last challenge is to get it working with the Pixy Cam.

The PCB design for the BQ25504 is complete. The hope is that the higher power inductor and larger planes and wider traces will allow for more current to be transmitted through the boost converter and into the secondary modules.

Open Questions and Concerns

None this week.

Gantt Chart

	Name	% Complete	Finish
1	**Commuter Tracking Sensor Network Project**	**65%**	**12/05/2014**
2	**Contact Monroe County**	**0%**	**11/11/2014**
3	Discuss deployment options for sensor nodes	0%	11/11/2014
4	**Networking Architecture Configuration and Testing**	**56%**	**11/14/2014**
5	Configure XBees for DigiMesh and have them communicating in close proxir	100%	10/16/2014
6	Range Test	50%	11/10/2014
7	Small-scale trail deployment	0%	11/14/2014
8	**Windlbelt power module design**	**92%**	**11/12/2014**
9	Breadboard prototyping	85%	11/12/2014
10	PCB design	90%	11/12/2014
11	Ship design for stamping	100%	11/05/2014
12	Spice Transient Analysis	100%	10/20/2014
13	**Windbelt power module construction and testing**	**0%**	**11/24/2014**
14	Solder on components	0%	11/21/2014
15	Continuity tests	0%	11/24/2014
16	**Server/Gateway setup**	**100%**	**10/31/2014**
17	Install software (Django, Apache, etc.)	100%	06/17/2014
18	Interface XBee with Pi	100%	10/31/2014
19	Install and configure fail2ban	100%	09/01/2014
20	**Server/Gateway testing**	**100%**	**10/31/2014**
21	Disable root login test	100%	06/16/2014
22	Set the SSH port to a non-standard port test	100%	06/17/2014
23	Disable password login test - must login with SHH key	100%	06/18/2014
24	Ping disabled test - looking into other options	100%	10/31/2014
25	White Hat Hacker Test	100%	10/13/2014
26	**Sensor Hardware testing and integration**	**21%**	**11/20/2014**
27	Begin playing with Pixy cam in USB tethered mode	100%	09/15/2014
28	Interface Pixy Cam with an XBee	20%	11/20/2014
29	Integrate with existing power module	3%	11/14/2014
30	**Sensor Enclosure Design / Testing**	**60%**	**11/21/2014**
31	Use cad tools to design sensor enclosure	75%	11/14/2014
32	Use 3D printer to etch out enclosure	0%	11/17/2014
33	Temperature test	0%	11/18/2014
34	Rain Test	0%	11/19/2014
35	Execute drop test	0%	11/20/2014
36	Fire test	0%	11/21/2014
37	**Windbelt Testing**	**95%**	**11/24/2014**
38	Early testing with focus on size	100%	09/05/2014
39	Early testing with focus on maximizing current production for varied fan spee	100%	09/08/2014
40	Early testing with focus on maxmizing current production for varied wind angl	100%	09/09/2014
41	Intermediate I testing with focus on smoothing levels for a half-wave rectifier	100%	09/24/2014
42	Intermediate II testing with focus on providing safe levels at the output of the	100%	11/13/2014
43	Intermediate II testing with focus on battery discharge time and voltage levels	50%	11/14/2014
44	Intermediate II testing with focus on safe output levels from voltage regulatio	90%	11/17/2014
45	Intermediate II testing with focus on providing safe voltage levels from secon	100%	11/18/2014
46	Advanced I testing with focus on duration and level of charge on battery witho	100%	11/19/2014
47	Advanced I testing with MPPT enabled for a solar energy application with foc	100%	11/20/2014
48	Advanced I testing with boost converter configured for MPPT with focus on sa	50%	11/21/2014
49	Advanced II testing with focus on configuring the boost converter for use with	100%	11/24/2014
50	**Integration Testing**	**0%**	**12/03/2014**
51	Advanced II integration testing with focus on single node in controlled enviror	0%	11/25/2014
52	Advanced II integration testing with focus on deploying a single node in an ou	0%	11/28/2014
53	Advanced II testing with focus on operation in outdoor environment for multip	0%	12/03/2014
54	**Sensor Software - Identify Targets**	**52%**	**11/14/2014**
55	Code review for Pixy software	100%	09/08/2014
56	Train camera for identifying walkers, bikers, and horses	40%	11/14/2014
57	Train camera to figure out what direction the target is going	40%	11/14/2014
58	**Database Creation**	**90%**	**11/05/2014**
59	Create mysql or mariadb database so data from trail can be saved to it	90%	11/05/2014
60	**Website Creation**	**100%**	**10/31/2014**
61	Create front end	100%	10/31/2014
62	Link to database	100%	10/31/2014
63	Create status webpage, hosted somewhere else	100%	09/05/2014
64	**Website Testing**	**100%**	**11/04/2014**
65	Sanitation Test	100%	11/04/2014
66	Password Protection Test	100%	11/04/2014
67	User Login Test	100%	11/04/2014
68	White-hat hacker test	100%	11/04/2014
69	**Target Data Communication**	**0%**	**11/21/2014**
70	Sensors communciate target data with each other	0%	11/21/2014
71	Sensors can communicate and write data to database	0%	11/21/2014
72	**Computer Vision Testing**	**0%**	**11/26/2014**
73	Early - Image Sensor Component Testing	0%	11/17/2014
74	Early - Image Sensor Component Testing	0%	11/17/2014
75	Intermediate - Infrared Component Testing	0%	11/18/2014
76	Intermediate - CV Algorithm Component Testing	0%	11/18/2014
77	Intermediate - CV Algorithm Component Testing	0%	11/19/2014
78	Advanced- CV Algorithm Component Testing	0%	11/20/2014
79	Advanced - CV Algorithm and Infrared Integration Testing	0%	11/21/2014
80	Advanced - Computer Vision and Networking System Integration	0%	11/24/2014
81	Advanced - Computer Vision and Power Management System Integration Te	0%	11/25/2014
82	Advanced - Computer Vision Acceptance Testing	0%	11/26/2014
83	**Deployment**	**33%**	**12/05/2014**
84	Deploy Nodes	0%	12/05/2014
85	Activate Website	100%	11/03/2014