Tenafly High School InvenTeam

– October –

October

Team Organization

- As a requirement, and also a method to organize the team, we have chosen 4 leaders for 4 different aspects of the team. The roles are as follows:

    o Administrative: Andy Jeong

    o Communications: Noam Lerner

    o Financial: Lydia Lee

    o Technical: Yuya Ong

- In order to enhance organization and efficiency of tasks throughout the course of our invention, we have tentatively divided the whole team into four sub-teams consisted of a researcher, a tester, a hardware technician, and a software designer. Each team was assigned a case study –an initial development plan viewed at different perspectives – to complete.

- This month, we held meetings once a week. However, due to variable individual schedules, it was rather difficult for all of us to discuss our ideas together. We felt the need to meet more frequently, or at least communicate amongst the team members. In addition to more interaction, the organization of the team, as well as the roles, was not clear to certain members and seemed insufficient; thus it was rather difficult to distribute the tasks. Much more discussion of organization of the team as well as meeting times is needed.

Accomplishments

- During our meetings, we discussed the pros and cons of our invention design idea, and we have slightly revised our idea. In addition, we have moved forward with the discussion of general behavioral problems that should be addressed in the invention, approached from diverse perspectives (caregiver, an outsider, patient, etc.)

- Our school has supported us in spreading the word about our InvenTeam and our proposed invention by holding a press conference during school on October 29th. Although no press officials could attend due to schedule conflicts, during the conference each member got a chance to talk about their personal motivation in working to help the Alzheimer's patients, as well as their goals for the project.

- Regarding our website, we experimented with various options such as Blogger, Tumblr, and Google Sites. Although none of these tools were ideal, we decided upon a Google Site because it would be connected to our email account, provide easy access and revision, and

allow for Google Analytics to be linked for visitor count. On the website, we first listed our members, 'Contact Us' page, and another page dedicated to our mentors and possible sponsors.

Challenges

- Our biggest challenge this month was website construction. We had a debate on the tool we would use for our blog because of different features each option offers. After finalizing with Google Sites, we considered purchasing our own site domain, www.thsinventeam.com.

- Since some of the members were not able to come to the meeting as often as we would like, we had to establish a way to check on their working progress. This caused us to introduce a 'weekly report,' a fillable-pdf file which each member is expected to submit every week reflecting their work contribution.

Goals for Next Month

- As our very first fundraiser, we plan to hold a bake sale on November 6th. This is expected to earn approximately $100.

- By December, we plan to have compiled all components and research done by all sub-teams, and have ordered all parts necessary for our initial prototype.

- We plan to read the Alzheimer's related novel *Still Alice* and also to find further media sources in order to raise awareness of the disease.

Needs

- In order to collect all weekly reports, we should establish a separate email account for submission use only. This will allow for better understanding of what each member is working on. In addition, we need to create a Google Drive folder in which we can store all pertinent materials, including researches and development document.

Tenafly High School InvenTeam

– November –

November

Team Organization

- The team has been further divided into two subgroups.
o Teams consisted of a researcher, a software designer, a hardware developer, and a tester.
o Teams led by each leader that will assist in accomplishing the delegated tasks.

- Division 1
o Each sub-team member takes the role of researcher, tester, software developer, or hardware developer according to the individual's expertise. With this form of organization, each sub-team will be given a specific task which will run through the researcher, software/hardware developer, and tester in that order to complete the assigned task.

Software Developer

- To design, architect, implement and develop code for this project
- To work closely with other members of the team, especially with the tester
- To **document** (aka properly comment) all of the written code in order to ensure potential developers can comprehend its functionalities and features.
- To write up a **technical documentation** based on the assigned components (most likely APIs and libraries specific to the certain component).
- To accompany your source code with a written documentation

Hardware Developer

- To design and construct both the electrical and/or non-electrical components of the watch
- To understand all of the safety procedures and operational procedures when working with any tools that may potentially risk injury.
- To use different variations of **CAD** (Computer-Aided Design) **Software** which allows engineers to help design, visualize, analyze and optimize their product.
- To research (with the assistance of the researcher), to look for designing and engineering ideas and tips to design and model the components or the schematics.
- To **document** not only the progress for the specific hardware, but also to complete a Hardware Development Plan

Researcher
- To assist other members as well as completing other areas of provided
- To research topics by finding resources and compiling reports that will aid in the construction of the prototype. A researcher will be using only resources from credible and reliable sources such as a database, government sites (-.gov), an organization (-.org) or a university website
- To work with the testers to conduct experiments and to run tests

Tester

- To not only conduct a technical assessment of the prototypes built to ensure that they surpass , but to also provide an in-depth analytical insight to potential causes and problems that may have arisen during the development process. You will be in constant communications between the developer and the hardware developers to provide feedback and speculation to resolve any issues.
- Formulate a series of technical assessments and experiments to conduct
- To consider all of the possible parameters and factors that may alter the results you are looking for.
- To compile a **Testing Report and Analysis** document for the corresponding component.

The assignments

Team 1

Developer: Noam L.

Hardware: Jennifer H.

Research: Lydia L.

Testing: Andy J.

Team 2

Developer/Hardware: Frank M.

Research: Hanna S.

Testing: Christopher K.

Team 3

Developer: Marcus G.

Hardware: Malcolm L.

Research/Testing: Leo K.

Team 4

Developer/Hardware: Yuya O.

Research: Cathy K.

Testing: Daniel L.

- Division 2
o Four sub-teams: Administration, Communications, Technical, and Financial.
o Each of these groups is headed by its respective leader. The members of the group are responsible for their delegated tasks. This will ease up the completion of the required work.

Assignments

Team 1 – Administrative
Andy J.
Leo K.
Daniel. L.

Team 3 – Financial
Lydia L.
Cathy K.

Team 2 – Communications
Noam L.
Sarah L.
Jennifer H.
Hanna S.
Chris. K.

Team 4 – Technical
Yuya O.
Malcolm L.
Marcus G.
Frank M.

Cooperation among sub-groups and sub-teams

- o Because the team has been broken up, it is important to maintain communication amongst the team members to make sure that all teams are on the same page in terms of both the technical and organizational aspects. To accomplish this, the leaders of each sub-group will be in constant communication and the technical leader will assume the role of scheduling/monitoring the work done by the sub-teams.

Accomplishments

Created and bought the domain for our website www.thsinventeam.com/

- o The website for our InvenTeam is available for viewing by those who are interested in the project. The website has been updated with team profiles which include pictures and short descriptions of each of the team members. The website also has a blog for those who wish to follow our progress.

Publicized project and raised money

- o Our team participated in the school-wide (Katy Perry's) Roar Video to raise awareness of our club to the students and faculty of Tenafly High School. Another way we raised awareness of our team was fundraising through methods such as bake sales and the Yankee Candle Sale. In addition to raising funds with our fundraisers, we explained our team goal to our customers in hopes of spreading awareness of Alzheimer's and our pursuit to assist those who are affected by the disease. For our next fundraiser, we hope to do a fundraiser with Friendly's.

Established a separate email account for submission of weekly reports
Consolidated ideas about all major features about our watch and docking station

- As a team, we reviewed the information we had collected pertaining to Alzheimer's with particular focus on its effect on patients' and caregivers' lifestyles.

Challenges

A Visit by Lemelson-MIT Program Representative

- Preparation of the presentation for our Lemelson MIT-InvenTeam representative Justin Lai was a little bit of a challenge because many of the members were busy with individual work, thus we were unable to practice together for the presentation as much as we would have liked.

Goals for Next Month

To keep in touch with the Alzheimer's community

- We hope to stay connected to the Alzheimer's community as much as possible to learn about the problem we are addressing and raise awareness of our group. This involvement may lead to more fundraising opportunities in our local communities

To continue working on ordering the actual hardware of our invention so we can start to apply our written programs into the hardware. This will require us to look into technical parts in more depth and adhere to a strict schedule to maximize productivity.

To contact more potential sponsors and donors

- We are looking to get AT&T to sponsor our project to gain access to their mobile network. With their mobile network, we will be able to establish the wireless communication between the watch and dock station over long distances. To do this, we will need to contact officers/representative of telecom companies (i.e. AT&T) that offer GSM (2G) service for our raspberry pi station.

Needs

To draw UML diagrams to portray the connection network

- Will need to keep careful note of the connection network to maintain good organization within our project. This way, we will be able to target problems easier if one exists.

To update contact information of team members

- Getting in touch with some of the team members have sometimes been a problem so we will update contact information and make sure that members constantly check for updates on their contact method (i.e. email and/or Google Plus).

To make purchases and continue working on construction of the dock station

- We must finalize the materials we will purchase after researching for libraries of source codes, user manuals, documents, datasheets, schematic diagrams, and tutorials for practical application onto our invention

To film a video to be used as a commercial

- The video needs to be completed by the EurekaFest. We plan to finish editing before the grand event and raise the awareness of our team as well as our invention for the Alzheimer's patients.

Tenafly High School InvenTeam

– December –

December

Team Organization

Team 1: RFID and Motion Sensor Gate Internal Prototype
- o The focus for Team 1 for this month was to research for different circuit boards to operate the RFID and Motion Sensor Gate in order to create the first internal prototype for out docking station. The components were ordered online while being wary for counterfeits by carefully reading through reviews of the products. While waiting for the orders to ship, we worked on gathering source codes and documentations necessary for building the sensor gate system.

Team 2: Smartwatch Display OLED & User Interface
- o To find and order OLED screen and tactile button related components   We were able to successfully find and purchase the components and currently are waiting for the orders to come in. While waiting for the orders to come in we searched for source codes necessary for the device. In addition to this search, we are looking into user interfaces for the smartwatch.

Team 3: Raspberry Pi Docking Station
- o This month, Team 3 began to work on experimenting and looking for distributions of the Linux operating system that we could use for our project.   We worked on testing different drivers and other key components for the device. During our tests we discovered a few issues with the operating system's compatibility with our device. Therefore, we are currently rectifying these issues such as overheating and boot freeze that occurs when Arduino is plugged in during initial booting of the Raspberry Pi. We are waiting for the order of the display components to come in. We are hopeful that we will find a driver that may support the device.

Team 4: GSM/GPRS
- o Team 4 was successful in configuring the GPS functionality of the device to work fully with an accuracy of +/- 10 feet radius. We have also finished developing primary external MySQL and internal embedded database functionalities of device and are currently undergoing rigors testing to ensure high integrity and assurance of functional and robust code. We are also working on GPRS communications of the device in order to successfully send and transmit data over 2G networks. We were successfully able to establish a GPS/GPRS communication method and External and Internal Database Systems

Accomplishments

- Our team has started the alpha build of the core firmware that will run the smartwatch and the docking station, and have started to researching sample algorithms to be used during GPS tracking of patients

- All teams continued to map out the networks we are creating with each team's respective component of the docking station and smartwatch.
- Sponsor/ contribution requests

- o We sent sponsor request emails to local officers/ representatives of a telecom company (e.g. AT&T) for 2G sponsor

Current progress of each team in subgroup 1 is as follows:

Subgroup1 - Team 1:
- Researched for the different components available out there in the market and ordered them.
- Now are currently pending for the parts, however in the meanwhile looking to gather source code, resources and
- Documentation necessary for building the actual sensor gate system.

Subgroup1 - Team 2:
- Researched and purchased LCD component for the smartwatch along with tact buttons for the device.
- Currently pending on the purchases for the components – however are looking for the different libraries and source code
- Necessary to have the device function.
- Additionally researching and looking for specifics on smartwatch user interface design styles and principles.

Subgroup1 - Team 3:
- Began to work on experimenting and looking for distributions of the underlying Linux operating system.
- Testing different drivers and other key components for the device.
- Currently rectifying issues pertaining to device overheating and boot freezes that occurs when Arduino is plugged in during
- Initial booting of the Raspberry Pi.
- Currently pending on the display components – however have already found a tentative driver that may potentially support the device.

Subgroup1 - Team 4:
- Finished GPS functionality of the device working fully under accuracy of less than +/- 10 feet radius of current location.
- Finished developing primary external MySQL and internal embedded database functionalities of device and is currently
- Undergoing rigors testing to ensure high integrity and assurance of functional and robust code.
- Working on GPRS communications of the device and being able to successfully send and transmit data over 2G networks.
- Currently working on an alpha build of the core firmware that will run the smartwatch and the docking station.
- Working and researching sample algorithms to be used during GPS tracking of patients.

Challenges/Obstacles

Finding circuit-related products

- o Because for most of the team members it is our first experience finding materials/boards such as a microcontroller we had to familiarize ourselves with the electronics market in order to locate the correct electronics. Because there are counterfeits in the market as well, we had to be wary of fraud. We also had to look for the lowest prices as well to be efficient with our budget.

Fundraising

- o We wish to conduct another fundraising event to pay for some of the additional parts we wish to purchase. We took the opinions of all of the group members in order to determine the items we will be selling in order to do the fundraiser.

Time management and organization

- o Our team had some trouble meeting deadline this month due to some time management problems that occurred among the seniors due to college application due dates. Although a little late, all tasks in were completed with a few days of delay.

Goals for Next Month

Increase the frequency of our meetings

- o As we get more and more orders in and close in to the Mid-Grant Technical Review, we will need to accelerate our progress rate by meeting more frequently for longer periods of time. The extra time will allow for more interaction/ communication among the members which will be crucial for the acceleration of our progress rate. We hope to also use the extra time to build and test the individual components in the presence of all team members to assure that all components are compatible with the other components developed by other teams.

Team Functioning

We faced some difficulty in communicating what to research, what was already done, and how the research should be organized for the use of other group members

Needs

We need to place donation boxes throughout school for further monetary support for the products we will need to buy.

Draw out the general positioning the devices within the docking station with attention to the orientation of the sensors and boards. We must also determine the general placement of the docking

station in relation to the locations of certain objects within a room such as windows, heaters, and furniture.

Create a Video for commercial in preparation for Mid-Grant Technical Review

Tenafly High School InvenTeam

– January –

January

Team Organization

- Continuing the team division from last month, we aimed to focus on our designated tasks and developing software and hardware designs.
- We experienced some difficulty due to lack of members' specialized skills and working only on one device at a time. For example, team 1, whose task is to complete motion and RFID sensor placements and compatibility with the docking station, had to designate the job of trial-coding to their only programmer available.

Team 1　　　　　　*(Team assignments can be found from previous month's report)*

The goal for this group this month was the continuation of the research of the sensors that will communicate with the docking station to prompt the Alzheimer's patient upon leaving from and returning home. This team was successful in obtaining some articles about the algorithms, and the programmers were able to use them as reference. We are hoping to have an intricate sensor system that will detect only what's needed, and this process will be continued until we find the adequate method.

Team 2

The goal for this group this month was to research the optimal user interface for the characteristics unique to patients with Alzheimer's. Some of the factors that are currently being explored are different color themes, fonts, font sizes, and alert sounds/tones (e.g. elements of Kansei Engineering).

Team 3

Team 3 focused on the research and algorithms associated with identifying characteristics of wondering of Alzheimer's patients to enable the smartwatch to communicate to the docking station quickly when the patient starts wondering. This group also looked into the development of the internal and external hardware of the smart watch as well as the software of the smart watch (i.e. GPS, GIS)

Team 4

The goal was to work on the internal and external hardware of the docking station, and also code the internal components to ascertain that the internals of the docking station will be able to properly receive and interpret strings of information sent from other connected components such as the sensors beside the door.

Accomplishments

- Motion Sensors: we checked to see the sensor working properly using test codes obtained from web sources and drew out the predicted schematics of PIR motion sensor
- Successful GPS Field testing and reception of text messages
- For a possible commercial at the end of the grant year, we continued to work on the script
- Hardware team continued to explore different types of mounting methods
- Researched about implementing RFID system from Hackaday
- Considered other options that would replace RFID (such as two long coils) because there was not enough documents we could refer to when trying to set it up.
- Continued to research about methods to implement the actual RFID & center 'station' for the docking systems

Mentors' Input
1) Roy Cohen: Computer Engineering Undergraduate Student at Rochester Institute of Technology
   Field of Advice: Smartwatch
   o Overview of Schematics of the original parts, Walked through different components
   o Showed us some examples of his work (surface mount devices), designing the boards
   o Drew out circuits using existing schematics from internet sources
   o Later will provide us with the links to useful and practical tutorials

2) Mr. Johnson: Former Electrical Engineer, Current Mathematics Teacher at Tenafly High School
   Field of Advice: Smartwatch
   o RF: different from regular processor-type circuits
   o Suggestion: take a look at old cell phone boards since it has all necessary components (use as a template) – circuit lines important while in processor circuits.

- Decided to use a motion sensor and a contact sensor to effectively detect whether the patient has left the house without the watch
   o Another component to purchase
   o Estimated power needed: Arduino 5V, raspberry pi 1200mA

Algorithms

- Research of anomaly detection of GPS, dementia patient and GPS tracking algorithms, and GIS (Geographical Information System) algorithms for GPS Tracking, and also additional key terms that are related to what we would like to achieve.
- Read about wandering algorithms, including the article "Detecting Wandering Behavior Based on GPS Traces for Elders with Dementia"
- Research of Anomaly Detection which is a term used to describe using certain algorithms or pattern to identify whether a patient/person is wandering. The research paper on this topic

suggested that certain paths of a patient with dementia show that the person encountered a problem (such as where to go). For example, turning 20 degree to the right and 40 degree to the left can represent that the person is lost.

Fundraising
- Planned to initiate the fundraiser to sell candies through the Old Fashion Candy Company.

User Interface Design

- Edited the UI flowchart draft to accommodate for the buttons

General Research

- "Detecting Wandering Behavior Based on GPS Traces for Elders with DementiaTh25.3-P0687" and "Monitoring Health by Detecting Drifts and Outliers for a Smart Environment Inhabitant" and " Statistical Real-Time Anomaly Detection For Individuals with Cognitive Disabilities" and spent time to analyze it.

Challenges

- One of the challenges that we faced was deciding what methods to continue our fundraising. Because raising money through fundraisers has proved to be difficult after the completion of a few of our fundraisers, we need to look towards finding donors as well.

- During the research of GPS Anomaly Detection, it was hard to find research articles that are not too esoteric. Some of the statistics were hard to comprehend and analyze as well.

- Because no one in the group is familiar with 3D design, members working on the external hardware design had to learn how to use software associated with 3D design by watching tutorials found on YouTube. Currently, there is a strong focus on familiarizing ourselves with Autodesk Maya and SketchUp.

Goals for Next Month

- More cooperation amongst each team in building beta-build prototype process

- Continue to the research of wondering characteristics to write a good algorithm to identify wondering through GPS readings

- Finding potential donors for supplemental money for expenses like travel

- Read and review electronic circuits and different types of common configurations to completely familiarize myself with our design.

- Research about BeagleBone Black and make a Pugh chart, comparing it to our previously used Raspberry Pi.

- Write algorithm to detect whether someone is passing by or whether they are approaching the sensor. Also keep an eye out for sources pertaining to mounting and implementing the sensor.

- Looking for potential donors

Needs

- Donation boxes, more fundraisers needed to cover the expenses
- Faster working pace, more interaction among members – some are ignorant of other members' effort/work

- We need to work on improving the communication amongst groups because individual groups are working on separate components of the invention. However, we must make sure that these individual components are compatible with the other components from other groups. Since we are now entering a stage of our development that involves more physical construction and coding of our invention, the need for communication between groups has increased a lot.

Tenafly High School InvenTeam

– February –

February

Team Organization

Overview

Continuing with the team division from the previous month, we aimed to consolidate the conceptual ideas concerning the layout of the user-interface by investigating the concept of Kansei Engineering and how this methodology can be tailored specifically for our purposes. This investigation involved exploring different colors, fonts, and alert sounds that can be used on the watch/docking station in order to make it easy to navigate through the features of our invention.

The people associated with the physical coding and organization of the components of our technology aimed to program the docking station and smart watch to be able to have some basic interaction with a user. For example, the group responsible for the docking station created a basic user interface layout which allowed a user to access the menu to designate a destination of interest and the menu to the settings. Because we had the Mid-Grant Review this month, all teams prepared to be able to present their respective topics in both a simple and comprehensive manner.

The user experience team worked on the designing aspect of the smart watch. This design process included tasks such as deciding the physical button layouts that will be used on the smart watch, reading scholarly articles pertaining to products for Alzheimer's patients, and determining at least two different quantifiable measurements about the watch to indicate its uniqueness in relation to other Alzheimer's technology.

Reorganization of the team

- There was a reorganization of our team into two main groups: the User-Interface group and the Technical group. The decision to reorganize the group into these two main groups as opposed to the four sub-groups came from the observation that the communication among the people responsible for the technical (hardware and software) aspect of the invention in each of the four sub-groups was not effective enough. This weak communication raised problems such as confusion as to determining what assignments were completed and what assignments still needed to be completed. The team also figured that we need a stronger focus on mapping out

the exact user-interface that we intend to implement on our invention. The solution to both of these problems was to reorganize the team into two main groups with one focused on user interface/experience and the other focused on technical aspects to accomplish tasks such as implementing the layouts of the user interface onto the docking station.

Accomplishments

Interface design

- We reviewed feedback from our MGTR concerning the menu designs and icons of both the smart watch and the docking station and determined that the watch layout must be simplified because there are too many options (i.e. too many buttons).

Mid-Grant Technical Review

- Organized and prepared for the MGTR prior to the presentation day by having each group familiarize itself with a specific facet of our invention (i.e. Sensor, UX interface, Hardware and Software/Algorithms).   Once familiarized, we had a short rehearsal which involved going through each team's presentation of its assigned facet and having the remaining group members ask questions about the group presentation to imitate what people may potentially ask during the MGTR.
- We sent out invitations to all parents and mentors for the MGTR
- We prepared a survey that was to be given to the attendees of the MGTR in order to get input on our presentation skills and invention ideas. These surveys were reviewed by the entire team during the   team meeting after the MGTR.
- Collected questions about our invention that caught our attention during that MGTR

Finances

- Continued to keep track of the items purchased
- The plan to place donation boxes throughout the town for additional funds was approved
  - Confirmed and consolidated plans for Stop and Shop donation and Friendly's fundraiser

Motion Sensor – Created a UML flow chart of the motion sensor and prepared to test the contact sensor

Informing Justin about our progress

- Prepared for the video conferences with Justin Lai
- Sent Justin files to be reviewed and his feedback to be considered and incorporated in the documents
- Determined the quantitative measures that we will focus on honing for EurekaFest

Challenges

One of the most difficult challenges we faced during this month was communication amongst the team members working on the technical aspect of the invention. Because our team was originally divided into four sub-groups, where each sub-group worked on a separate component of the invention, the people responsible for hardware/software for one group was not familiar with the hardware/software of the other groups. This caused problems because we are entering a stage where we would like to start putting all of the individual components together. This is why we decided to reorganize our team into two groups.

Goals for Next Month

- Create a more comprehensive map of the user-interface/experience while decreasing the complexity of the technology
- Putting all parts of the smart watch together to have an operational product. Then we can start to look into downsizing the watch to a reasonable size.
    o Look into battery level monitoring methods
    o Look into haptic feedback technology to provide alternate methods of alerts.
- Further research into the algorithms concerning the identification of wondering.

Needs

- Faster working pace and more interaction among members
- Need for a fully-functioning device
    o Establish a line of communication among the individual components of the docking

station and the smart watch.

- o Cooperation, Communication, Agreement

Tenafly High School InvenTeam

– March –

March

Team Organization

User Experience subgroup
- Review of the Mid-Grant Technical Review
- Recap of both positive and negative feedback
    o Provide an overall graphic showing the invention.
    o A good idea to have only one button/ instruction (not both yes AND no), just yes → new screen
    o Word commands rather than an alarming sound
    o Use of colors is important
    o Processing speed of someone with dementia has slowed down - the wait time has to be adjusted not to trigger alarms....
    o There can be a contact on the phone & contact to local police department
    o Notification, "Someone is coming to find you." (repeated at regular intervals)
    o Need an audio module in addition to textual screen
    o Lose sense of time (1 min = 1 hour).
    o During the discussions some of the topics talked about were waterproofing, the possibility of setting off a metal detector, what sort of clasp to use to hold the watch on, and how to have sensory inputs/outputs that related to caregivers as well as patients.
    o Since making the watch waterproof is really important, the team should work on that, and having 5 buttons will be very confusing for the patient to understand so make it something simple and easy. Also, the patient may not be able to read what the watch says because the font is too small, so I suggest that it should be better if it's audio.
    o Wander / predictive behavior idea is a good one. It could possibly be based on a high number of direction changes, rather than a comparison of duplicate absolute locations. Then the team would have less data to worry about.
    o The team spoke with confidence which is highly important to create credibility and leadership
    o The team enjoys the process; a great project for young engineers.
    o Consider the reasonable price of watch and station for practical future use. Also, emphasize which parts are different from the existing device.

- During the Skype chat with Cure Alzheimer's Fund, it was highlighted that our five-button design layout for the smartwatch would deter the Alzheimer's patient from using the technology due to lack of motivation and capabilities to handle its full potential functionalities.
- In order to incorporate further input from real-life patients undergoing this disease in early-onset phase, the UX team decided to prepare surveys – color, caretaker, sound –to observe general preferences for several aspects of the user interface.

Technical subgroup
-   Worked to implement a vibration feature using a motor and a coulomb counter for the smartwatch. As we were adding more features/ components to the watch system, it was necessary to re-draw the circuit diagrams for the watch.
-   Experimented with JavaFX, a software platform for creating and delivering rich internet applications used to, in part, replace the standard Java SE GUI library.

(information retrieved from http://en.wikipedia.org/wiki/JavaFX)

Financial subgroup
-   Planned and held fundraiser events such as a school-wide candy sale and Friendly's Fun-raiser event after school's annual Olympics Day.
-   Searched for a charter bus that will take us and our invention to the EurekaFest.

Accomplishments

-   With sufficient discussion within the User Experience subgroup, the button layout for the smart watch has been settled on a four-button design with two directional buttons on the bottom that will guide the patient backward and forward, one on top for emergency use only, and another on the side for accessing the options displayed by the prompt.
-   In improving the standard GUI library available in standard Java, we had some difficulty implementing of JavaFX with the pre-coded Java codes because some programmers were not oriented fully about this environment. It was hard but upon reading online tutorials and asking experienced users, it was resolved.
-   The User Experience subgroup almost finished preparing the surveys that are to be sent out to real patients. Once they are sent out and brought back with fully recorded data, the results should reflect what we should modify on our general design we currently have just developed.
-   As usual, the User Experience subgroup continued to research and look for published articles in a collective effort to find preferences and behavioral characteristics of early-onset patients, apart from first-stage ones.

Challenges

-   One of the major problems Tech members had to go through was JavaFX on the same environment they have been using. In building the graphical layout for watch, this advanced system required adjustments that we had not anticipated.
-   The early termination of the Pretzel fundraiser event in school due to school policy.

Goals for Next Month

-   Brainstorm quantifiable measurements distinguishing our product from existent technologies currently available in the market
-   Construct the user interface of the smart watch using the graphical approach we recently sought to

implement; cooperate with User Experience subgroup as necessary.
- Look for more effective means of financial support besides fundraisers

Needs

- We seem to be having trouble dealing with financial issues. As we start to construct the prototype, purchase backup components, and cover the miscellaneous fees in preparation for EurekaFest in June, a wider scope of fundraiser-like events should be held for continued financial support.

Tenafly High School InvenTeam

– April –

April

Team Organization

Cooperation between User Experience and Technical subgroups
- User Experience subgroup has been developing a simple user interface that best suits the needs of a patient in all daily activities. Technical subgroup has been programming and testing out JavaFX in order to create a functioning design that would follow the commands that User Experience subgroup has come up with. In a joint effort, the two subgroup leaders gathered to discuss what has been completed and what is still needed to be completed. Technical subgroup experienced some trouble proceeding without the input from User Experience subgroup.
- After discussing the history and plan for each subgroup, the two subgroups decided to eliminate and slightly modify how we approach in programming. The entire team gathered together and checked which of the intended features to retain and reject by considering their feasibility within the given amount of time. This is planned to be done another time in May in order to streamline the design as much as possible.

Accomplishments
- With finalizing the design layout of the smartwatch, we completed the flowchart of the screens for each scenario as well. After online collaboration through Google docs, the flowchart shows the positions of texts, icons, colors, font, font size, and the type of loop the screen will undergo.
- The destination feature on the docking station has been removed upon long discussion of the pros and cons. User Experience subgroup agreed that this particular feature will not be useful due to several reasons: practicality, privacy, and ease of use. If this feature were available on the docking station, then the patient's whereabouts would be constantly tracked by the caretaker, patient would need to input the destination upon every departure, would contradict our goal of creating an easy-to-use device.
- The construction of casing for the watch initiated this month. Some of the members volunteered to make the external design more aesthetically pleasing, instead of having other manufacturer build at a high cost. The process began with discussion of the type of material and color to use.
- Finalized the firmware, modified user interface, developed button trigger responses for all scenarios and primary GPS data structures.
- Completed Boundary Detection Systems for comfort zone (primary layer detection systems)
- Initial stage of docking station firmware
- Developed base systems for KD Tree structure of GPS Pathways. (Testing required with real data)
- Drafted initial plan for the WD Theta Algorithm
- Researched different approaches to ML based systems under Ambient Intelligence Systems.
- Developed base framework for the JavaFX framework - testing needed.

Challenges
- Communication between the subgroups was the major challenge this month due to vacation week and misunderstanding. User Experience subgroup failed to communicate to Technical subgroup, and vice versa on time, making it harder to proceed with efficiency. We needed to come together during the last week of April to recapitulate and summarize what has been completed again.
- Digitizer: some complications prevented the digitizer from working properly
- We attempted to reach out to several senior centers near our community in order to collect some data on preferences of actual early-onset Alzheimer's patients; however, the outcomes were not too successful due to privacy and contacting issues.

Goals for Next Month

- Create a UI Design for the Docking Station based upon the surveys and completed UML diagram of the Docking Station.
- We need to start preparing for EurekaFest by making a powerpoint and script of great quality

Needs
- More attention to communication between the subgroups in order to share and work cooperatively
- Needs to finalize the base structure for the docking station OS so the programming to take place and take actual data. With real data, JavaFX needs to be tested.

Tenafly High School InvenTeam

– May –

May
Team Organization

Technical Subgroup
- Within this subgroup two other sub-groups have been created in order to efficiently work with smartwatch and door station development simultaneously.
- The development of the docking station software and interface have begun already and started to find its shape. As the group develops the main utility frameworks for the docking station firmware, it also hopes to create the web-based application through our domain, thslmit.com. Also, this group continues to research GIS data structures.
- With the web portal system taking in place gradually, one of the goals of this subgroup includes the GPS and GSM serial communication systems.

User Experience
- Collaboration with the technical subgroup continued throughout the month. One of the goals of this subgroup includes completion of the design for the docking station interface – font, position, etc.

Hardware
- As we approach the EurekaFest, we decided to build our own casings out of wood and paint with spray paint ourselves. It was necessary that we start ahead of time in order to allow for sufficient time to build.

Accomplishments

The technical subgroup completed drafting the initial design for the docking station, began to setup thslmit.com with Laravel PHP Framework for the portal system, and drafted UML design for the database systems to be used in the system. The team developed base framework for the Raspberry Pi serial communication, and completed development for the web page.

In addition, the group created a mock interface designs on Photoshop of the docking station interface, completed Welcome Screen and Setup Procedure screens for the docking station, developed a serial interface system to communicate between the Arduino and the Raspberry Pi within the docking station, began to develop Serial interfaces for the GPS and GSM systems, and completed designs for the smartwatch and docking station builds.

The team plans to build the external casing of the entire system with wood and paint the casings with spray paint. The hardware subgroup has almost completed the design and the building of the smart watch stands of wooden boards with the pillow inside. The watch, with straps, will be sitting on a watch pillow at an angle for better view and through the pillow and into the wood box with shock proof mechanism built in, cables that connect the hardware and the watch will run. From the outside, it will look like a regular watch one sees in a watch shop, but it actually has all its hardware components separated. This will not only display the aesthetic side of our watch, but also the functional side of the

watch by showing the internal parts when asked.

The student leaders and advisors gathered to plan the script and powerpoint, which is expected to take a few weeks. The user experience subgroup also managed to collect a few surveys from senior care centers after numerous attempts hindered by personal issues of the patients.

Challenges

User Experience
- It was rather difficult to collect survey results for each of the three categories: sound, caretaker, and color. The directors of each senior care center were not as cooperative as we thought they would be, and it took numerous attempts and visits until we ended with two to three results.

Technical
- It was a bit difficult in setting up the Laravel to work with Dreamhost (domain server) due to complex configurations and settings, finding raw test materials to verify GIS system's applications, and establishing database connection between the Dreamhost servers. In addition, testing serial communications over the Arduino and getting the operating system to recognize the device, designing buttons around the smartwatch and developing components for the push buttons posed another challenge. Some members could not continue on with their roles due to the lack of the necessary information from other subgroups, such as the internal design.

Finance
- A carwash was planned, but due to popular demand by many other extracurricular clubs and sports, we decided not to hold this event as it would turn out to be a less effective one.
- We decided to host our last bake sale in school as the very last fundraiser event.

Goals for Next Month
- Last bake sale is scheduled for June 5th.
- After settling on one dimension for the docking station, the team must immediately start designing for the case and brainstorm a way to mount.

Needs
- Senior Options program (the school program for seniors only; similar to internship) was very useful in that it provided us more time to work on hardware and administrative tasks. Following

this month, in June other members will join this program and we will all work during school hours and after school.