**9/7/2017 Phone Meeting with L3**

Attendees: Professor Englot, Julio Martinez, Bob Arnold, Mike Garwood, Bryan Ranes, Jacqueline Zarriello, Roger, Max, Christina, and Kelly

* L3 voiced concerns about needing more CS/Software on the team
* Liked the abstract and the direction it was going in
* L3 wants a schedule of milestones
* Plan a meeting with mentors in the next week or so and then in person meeting at the end of September or beginning of October

**9/14/2017 TGE Lecture**

* Professor Contact Information
  + Gene Fisch
  + 917-526-0267
  + [genefisch@yahoo.com](mailto:genefisch@yahoo.com) (put name and TG section in subject line)
* Need to start interviewing a few people a week (per team member) to get a log of interviews
  + Find out what they would want in a potential product
* Start interviewing competitors
  + See if they will tell us about potential obstacles
* Create a draft of the team page
  + Pictures of team members
  + 1-2 paragraphs about each team member

**9/14/2017 Meeting with Professor Englot**

* L3 committed to a $5,000 budget
* There is leftover money from previous years projects
  + Professor Englot wants better confirmation that we can use some of this money
* Looking to use around $8,000
  + 3-4 robots
  + Money for mock environment
  + QR codes if needed (or AprilTags) for identification between the robots
  + Target for robot to “find”
  + Travel expenses in we have to go to Camden
* Look into how the specific LiDAR on the Waffle works
* Things to start working on and thinking about for the first milestone:
  + What do we want to do with the robots?
  + What are the strategies for them?
  + How will they communicate with each other?
  + What’s the year end demo going to look like?
  + What’s going to be centralized data and what will be shared?
  + What data are we going to measure, use and send?
  + Sketch out requirements (create 2 teams?)
* Prepare for phone calls with L3 to get more information from them (scope, direction and requirements)
* Reach out to vendors about buying robots (look into buying 4)
  + Interested in lead time
  + Professor Englot is going to a robotics conference in a few weeks
* Act as L3 is our customer (like corporate R&D)
* Professor Englot is going to email Julio on Monday about meeting sometime next Thursday

**9/21/2017 TGE Lecture**

* Add in more information to biographies about academic, leadership, etc. experiences
  + Add this information into the experiences and desire to work on this project
* Allocated roles for competitor analyses

**9/21/2017 Team Meeting**

* Split Milestone 1 into sections for the team to work on together and individually
* Worked on the project timeline (excel sheet)
* Goal for the semester: getting one robot working and 2D mapping and beginning the machine learning process (image recognition)
* 2 tentative subteams: SLAM (Roger and Kelly) and Image Processing (Max and Christina)

**9/21/2017 Pre-Phone Meeting with Professor Englot**

* We should have another concept selection matrix for different strategies and not only for the different robots
* Goal: Find/classify objects of interest
  + Level of manual control vs automation [manual (on-site and remote) vs automated support]
  + How will the system be initialized? [manual (on-site and remote) vs automated support]
    - Will they start from one central location (together or separately) or completely separated?
  + How will the environment be structured/instrumented (if at all)? [manual (on-site and remote) vs automated support]
    - Instrumented- QR codes, paint on floors, etc.
  + What sensing modes will be used to (1) localize, (2) look for objects of interest?
    - Constraints and assumptions
  + Algorithms of choice
  + Centralized vs decentralized decision-making
  + Tasks, roles, hierarchy among the team
    - There can be a leader, a follow, special roles assigned to one robot, etc.
* Professor Englot is going to get team in contact with Sandra K in the IDEAS office on the 4th floor of EAS to sign IP paperwork
  + Can talk to her about the leftover budget from previous years

**9/21/2017 Phone Meeting with L3 Team & Mentors**

Attendees: Professor Englot, Julio Martinez, Bob Arnold, Mike Garwood, Bryan Ranes, Jacqueline Zarriello, Chris Peng (mentor- ME), Rob S (mentor-CS), Roger, Max, Christina, and Kelly

* Julio wants to schedule a visit within the next three weeks
  + Tentatively the 2nd week of October
* What are our objects of interest?
  + Chris and Rob will look into use case scenarios for what this could be used for
  + Give us a better picture of what the objects would be and what type of ship it would be on
* Commercial vs military ship
  + Most Navy ships do not have wifi on them--they communicate with a bunch of radios
  + Communication would most likely not be able to be remote to the ship
* Level of user-interaction
  + The Navy is trying to minimize the crew set
    - Make the robot as autonomous as we can
* Action items for us:
  + Sign the IP forms
  + Have our schedule ready for the in person meeting
  + Provide L3 with our design proposal
* How can we augment the environment of the ship?
  + Could we paint the floor, add something to the environment, etc.
  + L3 would have to look into this
  + Depends on the type of ship this is being targeted for
* TensorFlow
  + Has tutorials for machine learning
  + 2D image classification
  + CIFAR

**9/26/2017 Phone Meeting with L3 Mentors**

Attendees: Team- Kelly, Christina, Max, Roger; L3- Chris (856-338-2833) and Rob

* 2D maps (not 3D merging)
  + Select object of interest
  + Precursor to 3D maps
* Proving out software and next team could work out hardware to make it more of a marketable product
* Chris- interested in SLAM and robotics portion
* Rob- better person to talk to about the ship aspect
* LiDAR to actively pick up the data points (create the pictures)
  + Lasers along 2 planes
* Pivoted away from a 3D depth camera
* Wireless network with each robot with a router to communicate with each other
  + Proof of concept: use local network/wifi for prototyping
* Dividing up roles
  + SLAM:
    - Mainly Roger
    - Kelly will help out?
  + Machine Learning:
    - Mainly Christina and Max
  + Administrative Stuff:
    - Mainly Kelly?
* System diagram- create this
* In person meeting on October 12th from between 1 and 6pm with some of the L3 Team Members
* Programming help from L3 with ROS, SLAM, Machine Learning (Tensor Flow)
  + Certain ROS package that we are focusing on?
  + Let Chris know asap when we choose a ROS package
* Images that LiDAR creates
  + Stitching of a picture?
  + Laser pulse (2D point cloud)
  + 360 degree ring
  + Measures distances and that’s what creates the “image”
* Chris will look for people that can help us with different packages and will set a time to come up on the 12th

**9/28/2017 TGE Lecture**

* Starting Executive Summary today in class and have a rough draft by next week
* Get feedback on competitor landscape
  + Can list things in bullet format and not always in paragraphs
  + Pictures, charts, etc.
  + Consistency, start off similarly (company info for something different)
  + Specifics
  + Market share
    - Large companies to get information from
  + Used for comparison to separate us from the others (not necessarily incorporate directly into the report)
* Mission Statement
  + Your goal (what do you hope to accomplish or what message do you want to send the world)
  + Scope- define parameters of the report
  + Company description
    - How are you different?
    - What problem are you solving?
  + Need to work on competitor analysis and have close to 40 (and analyze) by next week

**10/5/2017 TGE Lecture**

* Focusing on finance in lecture today
  + Cash is key
  + Cash flow statement (we’re going to create a basic cash flow for the executive summary)
* Deliverables:
  + Executive Summary
    - Financial cost breakdown for product
    - Mission Statement
    - Scope
    - Company Description
      * Problem being solved
      * Credible facts
  + Competitive landscape
  + Customer analysis
  + Team Page
* Company Description on Executive Summary
  + Talk about what makes you different
  + Give more details
  + Talk about why our solution is more efficient (reduces need for human interaction)

**10/5/2017 Meeting with Chris Post-Presentation \*I will skim through these and combine repeated topics\***

* Look for cargo options (like an unmanned/unknown vessel)
  + Looking for dangers and something that may fall
  + Looking for people
  + Drones being sent before the troops
  + Cover more area
  + Search (and rescue) the ship before sending in people
* Change the narrative with same technology
* 2D mapping- for geometrical purposes (navigation and dimensions)
* 3D depth camera- for more detailed information
* Picture showing 2D map layout
  + Add lots of pictures
* Focus on meshing and mapping
  + Collaborative mapping task
* Added machine learning because of initial meetings with L3
  + Too much?
* Chris is interested in SLAM (exposed a little)
  + FIRST Robotics Project
    - Idea was for more home security
* 2D LiDAR keep looking at 2D floor plan for this year of the project
* Machine learning may be pushed to future years?
  + Basic searching and mapping content as quickly as possible
  + For safety purposes
* 1 remote user (near by)
  + Possibly teleoperated?
* Will the human tell the robots to search for? Or will the robots go off and map and then deliver results?
* Live feed mapping?
  + Maybe for this year of the project
* Goal for this year: 10x10 room with some obstacles and see how long it takes to map out the room
  + Use english units
  + Use this to scale process up
* Live stream, encrypt
* Autonomous vs human driven robot network system
* Stitching the map together (like panorama of map)
  + Start with simple environment and then scale up with complication
  + 2D point cloud with 2D mapping (not 3D point cloud)
* What data would be more productive for a ship?
  + Structure or details
  + Point cloud to a grid map?
  + Would be helpful to have 3D image of the room
* 3D data product as end goal without machine learning aspect
* Need to feed data to a hard drive
  + 2D mapping eliminates some of the data
* Shared computation together in 2D and pasting the 3D data on top of it (SLAM)
* Send data to one computer/laptop
* Systems diagram or block diagram (show how the system will communicate)
  + What is the computation like?
  + Who’s doing what?
* Conclusion: no machine learning and focus on 2D mapping
* Searching a foreign ship, look at map and then people can go and look at the maps to go to the ship
* Meeting next week with L3 on Thursday (1pm)
  + Re-present the new scope so that Julio and other team members to get them to sign off
* Look at combining robot types together
  + Set up a hierarchy differentiating with different types of robots
* Goal for this semester is to get one robot to learn SLAM
  + Give them goals in Excel Spreadsheet
  + Develop requirements (more specific)
    - Verifiable requirements (add in time)
  + Make them simple-one thing at a time to verify them
  + A lot of software requirements
  + Modify system level requirements to be more higher level (general)
  + More specific with hardware and software
* Path planning
  + What kind of algorithm is it going to use?
  + Wall finding?
  + Like rumba or lawn mower pattern
  + Coverage planning
    - Depend on the main sensor
* Short field of view
  + Lawn mower
* Long field of view
  + Drive along the centerline of every room
* Explain in more details (ie what does full functional mean? Really fast? Add metrics)
* Pick a representative ship
  + Come up with the requirements for the full system and the prototype
* Make sure everything is logical (units)
* **Scope: evaluate unknown cargo space and secure the area and produce a map that can be inspected by one of the crew members**
* Drone deploy (3D scanning with a drone)
  + GPS system (we don’t have this)
  + Good examples to look at
* Future goal to go to 3D (other years?)

**10/12/2017 TGE Lecture**

* Financial Statement
  + Storage costs for 1,000
  + Insurance costs
  + Add in extra money for travel expenses
  + Add explanations
  + Break things down as much as possible
  + Support with a quote because numbers aren’t normally that round
* Presentation Tips
  + Add in why we are different (add into the beginning of the presentation)
  + 3-5 minutes next class mock “presentation”
    - Think of ways to make our first presentation better
  + Structure and confident
  + Think of ways to grab the attention of the audience
* Library of Congress--resource
* Thomson Financial--30 day trial for financial stuff??
* Presentation Breakdown
  + Project and why we’re different
  + Design consideration and requirements
  + Options of robots and strategies
  + Design selection

**10/12/2017 Team Meeting**

* Meet soon to finalize strategies (next week?)
* Download programs (Linux) needed (need flashdrive) by end of the weekend
  + Look for tutorials on how to do this
* Continue researching SLAM and familiarizing ourselves with ROS
* Revise work breakdown

**10/12/2017 Meeting with Professor Englot**

* Turtlebot Euclid
  + New turtlebot
  + 3D depth no LiDAR
  + Only available for pre-ordering right now
* Waffle is in stock (burger is not)
* Looking into 1 waffle (LiDAR and depth camera) and 2 burgers (LiDAR and runs on Raspberry Pi)
* Professor Brunell maybe has the remaining money from previous L3 projects
* Inspect a ship- build a map from scratch
  + Not always to drawings
* Send in swarm of robots and come out with 3D map of the entire ship quickly and efficiently
  + Start by focusing on one room
* Revise presentation and reports to reflect new change in scope
* Change scope to 3D mapping
* Professor Englot will confirm the budget before next Thursday’s meeting
* Detailed documentation of system architecture
  + Autonomous
  + How a user will interact with the system
* Linux and ROS- Kinetic (Create partition on laptops)
  + Look on turtlebot website
* ROS beginner tutorials
  + Navigation
  + G mapping (works best with 2D range finder)
    - Particle filter
* Distribution of tasks
  + Map out detailed architecture and development path to figure this out
  + Hopefully by end of milestone 2

10/12/2017 Team Meeting

* Efficiency of mapping
  + Method to make it as efficient as possible (not having multiple robots overlap a bunch)
  + Try to avoid each other?
  + Try to have them meet and then merge the maps that way?
* How will robots know when to return back to the starting point (map is completed)
* What are we going to do when the robot’s batteries are dying?
  + Have the robot or computer find best path and have computer tell robot when to return based on their battery information

**10/19/2017 TGE Lecture**

* Presentations

**10/19/2017 Meeting with L3 Team**

* Attendance: Orie, Julio, Rob, Chris, Professor Englot
* Focus on meshing 2 maps together
* Not solely ships--any unknown area (recon type of project)
  + Search and rescue without GPS
* Deliverables for Innovation Expo
  + Videos of the robots mapping
* Manual control
  + Single operator
  + Robots act completely autonomous
* Initialization
  + Start from single starting point
  + How they branch out from there
* Environmental Instrumentation
  + Unknown environments- no instrumentation
  + Beacons?
* Localization
  + Primarily 3D depth camera
* Hierarchy
  + Every robot doing the same thing
* Offloading information onto a static computer
* Avoiding obstacles
  + Navigation packages
  + Object avoidance
* Storage- external hard drive or computer

**10/24/2017 Team Meeting**

* Scheduled telecoms with Chris
* Setup first set of points for telecoms with Chris
* Decided on team name - Prometheus