Sprint Evaluation

From the second sprint to the end of this sprint, we spent most of our time on researching and reading articles about the next steps of the project. The topics that we paid attention during this sprint are as follow:

1- RRT (Rapidly Exploring Random Tree) algorithm which will be used for UGV so that the possible paths for UGV can be calculated and it can reach the specified target on a maze by following the chosen path. We will use this algorithm to find the optimal path for UGV so that it can leave the maze with some obstacles.

2- slam_gmapping (Simultaneous localization and mapping) which creates 2-D occupancy grid map from laser and pose data collected by a mobile robot. We can use this package in simulation part so that we simulate the maze whose images are taken by UAV on a distinct screen.

3- Joystick Control that will be used in case that if UAV behaves as not expected, we will control the behavior of UAV manually.

4- Hovering and Landing Control of UAV that will be carried out for processing of getting images of specified maze. We will give more importance to this step when we pass to real world operation since the working principle of UAV is one of the most significant step for the next functional steps.

5- Synchronization of tum_simulator and tum_ardrone which are the main packages that we are currently using and that will present importance of the project in the next steps. After all the considerations about the project we have decided to write some scripts for the tum_simulator and the tum_ardrone, using python2.7.6 as a programming language. The purpose of these scripts are for us to use the tum_simulator and tum_ardrone in a more efficient and simpler way. Also since we want the simulator and the UAV we choose, which is ardrone2.0, to work synchronized, we need these scripts to execute the both packages with the same code and in a synchronized fashion.

If it is required to give functionality information about this script, the related details are described as follow: tum_simulator's and tum_ardrone's move commands are different. Move command in tum_simulator takes speed as an argument, and move command in tum_ardrone takes position as an argument, also when you give the move command to tum_simulator, model in the simulator keeps going until you give another command to make it stop. Because of these complications, we intend to use gazebo's get state command to get position of the model in tum_simulator, and use this to synchronize 2 packages. We are going to solve that problem in tum_simulator by checking the models position in loop until it arrives the position we gave to the function in the script code, then we will give the stop command to the simulator. However, there might be some problems, since the model and the AR drone are not static in the air.

6- Simulation of UGV motion and maze on Gazebo which will make the overall operations more realistic and when those operations are carried out, user can be able to monitor the project progress on a different screen and Gazebo facilitates our task in this step. It has an ability to simulate the image streams taken by the UAV(AR Drone 2.0

Moreover, we made some changes on our plan. Since we are now still working on simulation environment and required synchronization operations for related packages and finding optimal algorithms for stabilization issue of UAV flight took more time than we expected, we could not pass real world operations and we postponed this part to further sprints.
Moreover, we needed to make some updates on our backlogs list which are specified in details in part 3.

Team evaluation

We were working as a team in the first part of project Raven Nest, because all team members Should have understood the working logic behind ROS and tum_simulator and how the process is going to be operated. And now, we will continue to working as a team for understanding more conceptual subjects. Additional to this, we will make more academic research in order to improve our project's efficiency and finding more suitable and stable solutions for our problems.

Thus, we take care of attention to work together to understand the ideas, tasks and concepts. So far, we have installed the all required tools and packages and achieved to run Quadcopter on both simulation environment and real-world and we created various simulation for improving our auto-pilot system.

In our progression process we had meetings every week with our counselor assistant Burak Kerim Akkuş and our counselor instructor Dr. Temizer. Beside these meetings we get advice with mails or consultation time to time with our counselors which contributes us to progress on our project accurately and helps us in terms of improving our workings and researches on the project. After ended working on simulation system, we are going to focus our separate tasks for each team member. As a team, we consider that we chose a correct strategy for this part and next parts, and will try to continue applying those strategies at the end of the project.

Task	Assigned Member	8th Week				9th Week				10th Week			
Understanding, Analyzing & Evaluating Related Papers	**1.** Mehmet Akif Akpınar **2.** Mustafa Buğra Tamer **3.** Rana Aygül **4.** Kadir Ekmekçi												
Synchronization of tum_simulator & tum_ardrone	**1.** Mehmet Akif Akpınar **2.** Mustafa Buğra Tamer **3.** Rana Aygül **4.** Kadir Ekmekçi												
Searching alternative simulation environment	**1.** Mehmet Akif Akpınar **2.** Mustafa Buğra Tamer **3.** Rana Aygül **4.** Kadir Ekmekçi												
Second Simulation: Second simulation with more complex commands and plans	**1.** Mehmet Akif Akpınar **2.** Mustafa Buğra Tamer **3.** Rana Aygül **4.** Kadir Ekmekçi												
Prepared 3nd Retrospective Document	**1.** Mehmet Akif Akpınar **2.** Mustafa Buğra Tamer **3.** Rana Aygül **4.** Kadir Ekmekçi												

Backlog Updates

1) We decided to use tum_ardrone & tum_simulator simultaneously and synchronal for maximum efficiency in both monitoring and creating missions. For synchronization we have to create a script for creating valid inputs for both packages simultaneously.

2) We decided to create another script which sends commands to tum_simulator for executing any plan created. The main challenge of this program is converting speed commands of tum_simulator to commands uses coordinates.

3) Because of the copter's flight is not stable and tend to change with any effect, we decided to create an algorithm for stabilization of flight of the quadrocopter by using the current coordinates of the copter and updating flight parameters according to these coordinates.

4) We decided to use an alternative simulation environment for project since Gazebo's limitations.