**I. INTRODUCTION**

This business statement reports contains the general information about the company and elaborations on the available 5 projects. A brief history of the company, mission and vision of the company, personal information about the co-owners and detailed examination about the projects are included.

**II. ABOUT HITHERTO ROBOTICS**

HITHERTO ROBOTICS was found in 2014 by 5 co-owners, namely, Latif ÇANDIR, Emre GEDİK, Hüsnü Doğan KILIÇ, Berk İNCE and Aykut DEMİREL. The contact information and CV's of the co-owners can be found in the Appendix A.

**Mission:** Our mission is to design and produce intelligent robotic systems by combining innovative approach, experience and high-end technology.

**Vision:** Our vision is to produce robots serving in all fields of life by meeting the customers' expectations and become the best robotic company in the world within 20 years.

**III. ABOUT THE PROJECTS**

**III.I. PROJECT-I: A SYSTEM PLAYING ONE-ON-ONE VOLLEYBALL**

As implied by its name, we are supposed to design a system that can play a manipulated volleyball game against its counterparts. The game is called as manipulated since unlike the real volleyball, the system is to play the game on an inclined surface, horizontally. The inclination is 15 degrees and the field is 1x1 m. The net is 30 cm in height and 10 cm in width. The robots' hitting surfaces cannot exceed 10 cm.

The game is started with a serve. Who starts the game is determined by a coin toss. For each score, the game starts again with a serve and the team who start is determined by 1-2-2-2-... rule. If one of the teams reaches 5 points or the difference between the teams reaches 2 points, the game is over.

We may face some difficulties about perceiving the moving ball accurately and fast enough. In order to that, we have to use very sensitive equipments ant that increases the cost. Even if the right equipments are used, it is still a difficult task to adjust them precisely. Another difficulty is to hit the ball with a correct strength and angle. According to the type of the ball, mechanical hitting surfaces must be hard or soft.

In this project, we may use image processing to sense the ball, PID control algorithms to move the robot to the ball, DC, servo and step motors to provide all kinds of movements and a microcontroller to perform all of these. There is no need to communicate with the opponent for this project.

**III.II. PROJECT-II: A MOBILE DEVICE TO COLLABORATE WITH OTHERS TO DRAG BOXES INTO A ROW, IN CORRECT ORDER**

Designed devices for this project are supposed to pick one of the numbered boxes in the field and put it into correct order by communicating other devices.

When we examine the project; we see that the mechanical and electrical part of the project is relatively easy to the other projects. The main issue is how to decide which boxes to be picked up by the device. Since the devices are to work with each other, it is very important to determine the standards properly and clearly. Communication between the devices may be the most important and problematic part of this project. As the number of devices increases, it gets difficult to adjust the work sharing.

We may use image processing to understand the order of the boxes from the figures on them, motors for the movements, RF communication systems to send and receive information from other robots and a microcontroller to manage the process.

**III.III. PROJECT-III: A DEVICE WHICH CAN PLAY CAROM BOLE STYLE BILLIARDS**

We are supposed to design a robot playing billiards. The game will be a carom bole style but without rails around the field. The player scores a point continues to the game. If one player reaches 5 points or the difference reaches 2 points, the game is over.

The main difficulty in this project is to adjust the angle and strength of the hit. There are many variables affecting the hits such as distances between the balls, angles between them and whether the ball is ''your ball'' or ''the opponents ball''. The oral commands requires a good signal processing and it is difficult, too.

We must use image processing to calculate the distances and the angles, signal processing to understand the verbal commands, motors for movements, a microcontroller to manage the process.

**III.IV. PROJECT-IV: A SYSTEM IN WHICH A SLAVE FOLLOWS THE MASTER TO FORM A PARADE-IN-FORMATION**

We are supposed to design a robot which can be the master or the slave. Slaves follows the master from behind, on the right or on the left. Slaves must do whatever the master does.

Robots must be very sensitive to distances because at most 20 cm is allowed between robots. It is difficult to change formation or master while moving. The communication between the devices is very important. If it is not well-designed, a chaos will be created. The standards about the command sending and receiving, master carrying platforms must be well-defined also.

We may use image processing for formation, RF communication systems to send and receive information, motors for movements and a microcontroller to control the whole system.

**III.V. PROJECT-V: VEHICLES COLLABORATELY CARRYING A LONG OBJECT OVER A ROUGH TERRAIN WITHOUT TILTING**

We are supposed to design a device that can communicate with its counterpart to carry a long object over a road. The road is defined by the equation;

The devices carry the object without tilting and without increasing or decreasing the distance between them. Devices are to communicate wirelessly, so we may have to use RF communication.

This project is all about control and stability. The main difficulty of this project is keeping the platform horizontal at all the time. We have to decide, whether the arms or legs of the device move vertically to keep the object horizontal or any other method is used. In addition, the speed of the robots should be constant while the robot moving downwards upwards or in a flat road.

We may use PID control, RF or infrared communications to send or receive information from others, motors for movements and a microcontroller to manage the whole process.

**IV. CONCLUSION**

In this business statement report, by declaring our vision and mission, we form our institutional structure.

By examining all of the projects one by one, we recognized the advantages and disadvantages of them and we had an idea about which project we are going to choose most probably. Examining the projects in details helps us to make more logical decisions to choose the future work of our company. While studying the projects, we consider what can be the modules of the devices, which difficulties we can face and how we can solve these problems with less effort and cost.

Thanks to this brainstorming, we were well-informed about the projects, we experienced the team-work effectively and we are going to shape our future accordingly.