

MIDDLE EAST TECHNICAL UNIVERSITY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EE493 ENGINEERING DESIGN I

Car Chasing Robot Proposal Report

Supervisor: Assoc. Prof. Emre Özkan

ADDDRESSS

Project Start: 4/10/2018

Project End: 26/5/2019

Project Budget: \$450

Company Name: Duayenler Ltd. Şti.

Members	Hardware Design Engineer Embedded Systems Engineer aş Control Engineer	ID	Phone
Sarper Sertel	Electronics Engineer	2094449	0542 515 6039
Enes Taştan	Hardware Design Engineer	2068989	$0543\ 683\ 4336$
Erdem Tuna	Embedded Systems Engineer	2617419	$0535\ 256\ 3320$
Halil Temurtaş	Control Engineer	2094522	$0531\ 632\ 2194$
İlker Sağlık	Software Engineer	2094423	0541 722 9573

November 9, 2018

Contents

1	not	es	2								
	1.1	problem statement, societal impact of the project,	2								
	1.2	company organization (human resources, etc.),									
	1.3	specific requirements and objectives of the project	2								
	1.4	approach to the solution of the problem	2								
	1.5	outline of the requirements for any standards that the product would need									
		to comply with, \dots	2								
	1.6	deliverables and expected outcomes of the project,	2								
	1.7	tentative cost-budget analysis,	2								
	1.8	time plan (Gantt chart),	2								
1.8 time plan (Gantt chart),											
3											
4	Tea	m Organization	2								
5	Rec	quirement Analysis	3								
6	Sta	ndards Section	4								
 2 Executive Summary 3 Introduction 4 Team Organization 5 Requirement Analysis 											
8	Exp	pected Deliverables	4								
9	Cor	nclusion	5								
Δ.	nnen	dix A. Gannt Chart	5								

1 notes

- 1.1 problem statement, societal impact of the project,
- 1.2 company organization (human resources, etc.),
- 1.3 specific requirements and objectives of the project
- 1.4 approach to the solution of the problem
- 1.5 outline of the requirements for any standards that the product would need to comply with,
- 1.6 deliverables and expected outcomes of the project,
- 1.7 tentative cost-budget analysis,
- 1.8 time plan (Gantt chart),
- 2 Executive Summary
- 3 Introduction
- 4 Team Organization

Our team



Figure 1: Company Tree

5 Requirement Analysis

Reqs, soln puanlama

	Having Fun	Competition	Original Solution	Budget	Mechanical Challenges	Complexity	Marketability	Total	Weighted Objectives
Having Fun	0	0,5	0,75	0,8	0,9	0,6	0,8	4,35	0,2
Competition	0,5	0	0,7	0,7	0,5	0,75	0,8	3,95	0,2
Original Solution	0,25	0,3	0	0,6	0,7	0,55	0,8	3,2	0,16
Budget	0,2	0,3	0,4	0	0,2	0,3	0,8	2,2	0,1
Mechanical Challenges	0,1	0,3	0,3	0,8	0	0,3	0,8	2,6	0,12
Complexity	0,4	0,25	0,45	0,7	0,7	0	0,8	3,3	0,16
Marketability	0,2	0,2	0,2	0,2	0,2	0,2	0	1,2	0,06
								20,8	1

Figure 2: Pairwise Comparison Charts

	Having Fun (0.2)	Competition (0.2)	Original Solution (0.16)	Budget (0.1)	Mechanical Challenges (0.12)	Complexity (0.16)	Marketability (0.06)	Total
Balloon	8	10	6	4	0	2	6	5,28
Balloon	1,6	2	0,96	0,4	0	0,32	0,36	5,26
Air Hockey	8	8	4	8	2	6	8	5,84
All Hockey	1,6	1,6	0,64	0,8	0,24	0,96	0,48	3,04
Chasing Cars	10	8	8	6	6	8	10	7,48
Chasing Cars	2	1,6	1,28	0,6	0,72	1,28	0,6	7,40
Manusina	4	4	8	2	8	0	6	4,04
Mapping	0,8	0,8 1,28		0,2	0,96	0	0,36	4,04

Figure 3: Project Evaluation Chart

	Performance	Marketability	Environmental Effects	Feasibility	Total	Weighted Objectives
Performance	0	1	0,8	0,8	2,6	0,45
Marketability	0	0	0,4	0,35	0,75	0,12
Environmental Effects	0,2	0,6	0	0,5	1,3	0,23
Feasibility	0,2	0,35	0,5	0	1,05	0,2
					5,7	1

Figure 4: Pairwise Comparison Charts for Objectives

	Fast Operation	Robust	Weight Balance	Total	Weighted Objectives	Weighted Objectives
Fast Operation	0	0,55	0,4	0,95	0,32	0,144
Robust	0,45	0	0,5	0,95	0,32	0,144
Weight Balance	0,6	0,5	0	1,1	0,36	0,162
				3	1	0,45

Figure 5: Pairwise Comparison Charts for Sub-Objectives

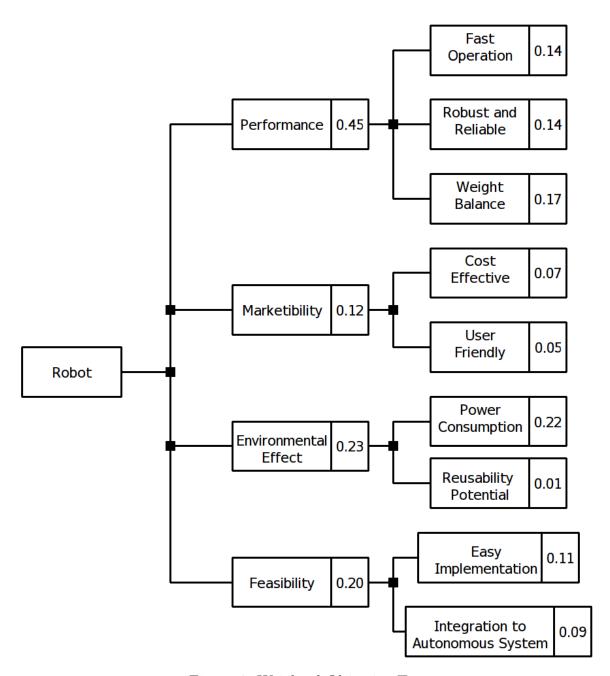


Figure 6: Weighted Objective Tree

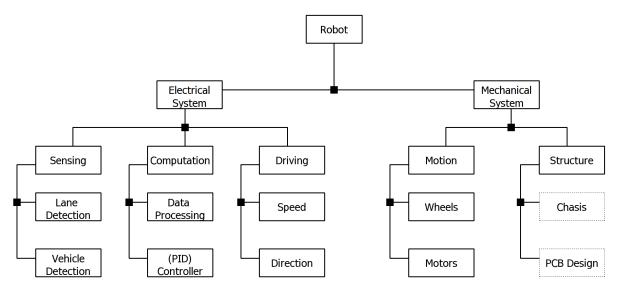


Figure 7: Weighted Objective Tree

- 6 Standards Section
- 7 Solution Procedure
- 8 Expected Deliverables

- 9 Conclusion
- A Gannt Chart

problem sufficiently important to justify money, company time, and your effort?

Is the

Is the

T0+ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 24 25 25 25 25 25 25		
3 Conceptual Design and Preliminary Design Phase (4 Weeks) 4 Critical Design Phase (18 Weeks) 5 Test & Evaluation Phase (19 Weeks) 6 Implementation & Finalization Phase 7 Project Ending (T0+28 Weeks) 1 Concept Development Phase 1.1 Activities 1.1.1 Literature Research and Determination and Similar Platform Specifications 1.1.2 Feasibility Works 2 Assessment of System Requirement Phase 2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
3 Conceptual Design and Preliminary Design Phase (4 Weeks) 4 Critical Design Phase (18 Weeks) 5 Test & Evaluation Phase (19 Weeks) 6 Implementation & Finalization Phase 7 Project Ending (T0+28 Weeks) 1 Concept Development Phase 1.1 Activities 1.1.1 Literature Research and Determination and Similar Platform Specifications 1.1.2 Feasibility Works 2 Assessment of System Requirement Phase 2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.1 General Component Research		
5 Test & Evaluation Phase (19 Weeks) 6 Implementation & Finalization Phase 7 Project Ending (T0+28 Weeks) 1 Concept Development Phase 1.1 Activities 1.1.1 Literature Research and Determination and Similar Platform Specifications 1.1.2 Feasibility Works 2 Assessment of System Requirement Phase 2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
6 Implementation & Finalization Phase 7 Project Ending (T0+28 Weeks) 1 Concept Development Phase 1.1 Activities 1.1.1 Literature Research and Determination and Similar Platform Specifications 1.1.2 Feasibility Works 2 Assessment of System Requirement Phase 2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
7 Project Ending (T0+28 Weeks) 1 Concept Development Phase 1.1 Activities 1.1.1 Literature Research and Determination and Similar Platform Specifications 1.1.2 Feasibility Works 2 Assessment of System Requirement Phase 2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
1.1 Activities 1.1.1 Literature Research and Determination and Similar Platform Specifications 1.1.2 Feasibility Works 2 Assessment of System Requirement Phase 2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
1.1 Activities 1.1.1 Literature Research and Determination and Similar Platform Specifications 1.1.2 Feasibility Works 2 Assessment of System Requirement Phase 2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
1.1 Activities 1.1.1 Literature Research and Determination and Similar Platform Specifications 1.1.2 Feasibility Works 2 Assessment of System Requirement Phase 2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
1.1.1 Literature Research and Determination and Similar Platform Specifications 1.1.2 Feasibility Works 2 Assessment of System Requirement Phase 2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
1.1.2 Feasibility Works 2 Assessment of System Requirement Phase 2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
2.1 Activities 2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
2.1.1 Determination of Team Logo and Vision & Mission 2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
2.1.2 Problem Define State for All Projects 2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
2.1.3 Solve Defined Problem State for All Projects 2.1.4 General Component Research 2.2 Outcomes		
2.1.4 General Component Research 2.2 Outcomes		
2.2 Outcomes		
2.2.1 Business Statement Report		
3 Conceptual Design and Preliminary Design Phase		
3.1 Activities		
3.1.1 Preliminary Electrical System Design		
3.1.1.1 Preliminary Sensing Unit Design		
3.1.1.2 Preliminary Computational Unit Design		
3.1.1.3 Preliminary Driving Unit Design		
3.1.2 Preliminary Mechanical System Design		
3.1.2.1 Preliminary Motion Unit Design		
3.1.2.2 Preliminary Structure Design		
3.2 Outcomes		
3.2.1 Preliminary Report		

	T0-	+ -	1 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
4	Critical Design Phase																												
4.1	First Semester																												
4.1.1	Electrical System Design																												
4.1.1.1	Sensing Unit Design																												
4.1.1.2	Computational Unit Design																												
4.1.1.3	Driving Unit Design																												
4.1.2	Mechanical System Design																												
4.1.2.1	Motion Unit Design																												
4.1.2.2	Structure Design																									i			
4.1.3	To be detailed																									i			
4.2	First Semester Outcomes																												
4.2.1	Standards Report																												
4.2.2	Module Test Demo																									i			
4.2.3	Conceptual Design Report																												
4.2.4	Presentations																												
4.3	Second Semester																									i			
4.3.1	To be detailed																									1			
4.4	Second Semester Outcomes																									i			
4.4.1	Critical Design Review Report																												
5	Test & Evalution Phase																												
5.1	First Semester Activities																									i l			
5.1.1	To be detailed																									i			
5.2	First Semester Outcomes																									i			
5.2.1	To be detailed																									i l			
5.3	Second Semester Activities																									i			
5.3.1	To be detailed																												
5.4	Second Semester Outcomes																									i l			
5.4.1	Critical Design Review Report																									i			
6	Finalization Phase																												
6.1	Activities																												
6.1.1	To be detailed																									i			
6.2	Outcomes																												
6.2.1	Finalized Product																												
6.2.2	Final Report																												
6.2.3	Final Demo	T								П																		T	
7	Project Ending																												