Temporary Tigers

University of Southern Denmark

5 Tigers

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Abstract

This work is summarising development process of an autonomous vehicle.

Dedication

Hardworking group of students that decided to become tigers, (o)hm pardon, engineers

Acknowledgements

Chapter 1

Introduction

1.1 Preliminary ideas

A brainstorming chart was created to get an insight into each idea suggest for evaluation. 15 ideas were listed and described buy these categories: mechanical challenges, electronics challenges, software challeges, components, potential market, cost, machine learning, sponsorship potential, user safety. Each cathegory consisted from 1 to 5 informations.

	weight	Snowcat	Weeder	War	Danfoss	Water	Dog	Lablador	Eva
Originality	20%	5	6	6	1	7	6	8	5
Budget	5%	1	8	4	8	7	2	8	6
Software	10%	3	2	2	8	7	1	5	1
Electrical	10%	6	5	3	8	5	3	5	4
Mechanical	10%	5	5	5	8	3	2	7	5
Scalability	5%	1	7	1	2	5	2	7	5
Availability	5%	6	5	6	1	7	6	8	5
Demanding	5%	3	3	3	8	3	3	3	1
Relevant	30%	5	3	4	7	8	5	4	2
Tolal		66	98.5	72.5	70	118	75.5	111.5	79.5

Table 1.1: Evaluation of preliminary ideas

1.2 Market research

Before the requirments and workcycle was determind there was an analysis of 4 different companies that are producing unmanned life saving boats or buys. The analysis is consisting of short description and a table comparing technical specification. All the data will be used during the requirement writing, so that the product is capable of potential competition on the market.

1.2.1 Emilly boat

It is 127 cm long boat with a buy covering the top of the boat. It controlled by RC and a rope can be attached to it in order to get it back on shore after being deployed. It has 4 other modifications, police, sonar, man over board and swift water. It is powered by one motor that is also used for steering.

1.2.2 Hover Ark H3

It is Remote controlled Lifesaving buoy controlled by RC with the function of an automatic return in case of lost signal. It has and upgraded version with lights for better visibility. It is capable of transporting the rescued person back to the shore,but he/she has to be able grab on it.

1.2.3 Orca H9

Livesaving watercraft that is the most powerful from all the products listed. It is manned vehicle that can carry a single lifeguard and carry or drag the victim back to the shore.Its is powered by one water jet engine.Compared to the jetski is more compact and needs less power.

1.2.4 Dolphin 1

The look and usage of this lifesaving buoy is similar to Hover Ark H3. Except that it has an extra camera in the front and is a bit larger.

1.2.5 Water Rescue Stretcher Bed

It is the extended and more powerful version of Dolphin 1. Between its two propellers is located the stretcher bed onto which the person can be placed and does not have hold it during the transportation.

Product/Parameters	Size[mm]	weight[kg]	power[w]	runtime@speed[km/h]	payload[kg]	control
EMILY	1230x355x355	12		13min@37	700	RC+rope
Dolphin 1	1190x850x200	13	1800	30min@12	225	RC
Stretcher bed	1680x730x260	30		30min@15	200	RC
Orca H9	910x53x32	23	4500	80min@16	300	manual
Hover Ark H3	1030x630x20	13.8		45min@18	200	RC+autoreturn

Table 1.2: Comparison of products

1.2.6 Conclusion

After the investigation was concluded that all of the products has to be navigated by person to the victim. Only Hover ark is capable of an automatic return. Therefore there is a space for extended functionality of navigation to the victim or to a lifeguard as an assistance. 1.1

1.3 Working cycle description

1.4 Theoretical analysis

1.5 What to consider before choosing GPS module

List of needed requirements	
Type of requirement	specific of the requirement for the project
size wristband	max 30 mm x 30 mm
size boat	max 60mm X 60mm
update rate	1-10 Hz
power requirements	3.3/5V - we make a voltage regulator
number of channels	?
time to first start	?
antenna	best if included
accuracy	the more precise the better, budget limitation , at least 3 m horizontal accuracy
microcontroller compatible with	Arduino

1.6 Considered options and their specifications

1. Spark Fun RTK-SMA
   The SparkFun RTK-SMA GPS module is very precise, up to 0.01m in horizontal accuracy. However, the price is 250 $ which is out of the semster project budget. The module is advancted and can do RTK. However, it is not needed for the prototype of the project. link to the datasheet: `https://cdn.sparkfun.com/assets/f/8/d/6/d/ZED-F9P-02B_DataSheet_UBX-21023276.pdf?_gl=1*150sgcj*_ga*MTAxMTI1MDc4OS4xNjgxNzE5ga_T369JS7J9N*MTY5Njg3NjM0Mi40LjEuMTY5Njg3NjU1OS42MC4wLjA`

2. NEO - 6
   Due to its low price relative to the functionalities it offers and compatibility with arduino, this module is indisputable choice for those who want to learn how GPS works.This module is based on NEO-6M chip from U-blox. It has a Pover Save Mode that makes it suitable for a wristband locator. It is also the smallest chip amnog the others listed in a Table 1.3 It includes antenna with sensitivity patch of 161dBm.

3. BN-220
   The needed requirements are fullfilled despite the price. Which for 1000 krones budget is too high if the shipping price is added. link to datasheet: `https://files.banggood.com/2016/11/BN-220%20GPS+Antenna%20datasheet.pdf` [1]

1.7 Comparison

requirement	Spark Fun RTK-SMA	NEO - 6	BN-220
size	X	X	X
update rate	X		X
power	X		X
desired number of channels			72
time to first start (cold/warm)	-148dBm/-157dBm		26s/25s
antenna			
accuracy of min 3 m	X	X	X
compatible with Arduino	X	X	X
budget	not in the budget		about 150 krones but expensive shipping

Table 1.3: GPS modules comparison

Bibliography

[1] Donald E. Knuth. *The TEX Book*. Addison-Wesley Professional, 1986.