RoboCupJunior Rescue Line 2023

Engineering Journal

Team BitFlip

Abstract
This document is mainly about our development process and how we divided the work within our team. Through past RoboCup Junior participations, we gained plenty of experience on how to collaborate efficiently within a team, mainly due to trial and error and constant documenting on what we can improve.
Despite the abstract you are currently reading, this document mainly features a table where we tracked our development process over the past months. To facilitate collaboration, we shared this document through Google Docs with all team members and used a color code to identify areas of responsibility between all team members. The color code is as follows:

Sven Saeger
Jan-Niklas
Lukas
Whole Team

Furthermore, we met on a regular basis, mostly through video calls, however we also made use of GitHub and Trello to manage our todos.

Date	Agenda	Progress/Status	Next steps
July 2022	- Define project requirements and specifications (new rules?!) - Research and select components for the robot (mainly actuators) - Begin designing the robot chassis - Buy essential parts	- Selected four 12V DC motors (Pololu 20D) - Researched various servo options and decided to use two servos for arm control and container gate control - Bought according servos - Designed and 3D-printed mounts for the servos and motors	- Complete the design of the robot chassis - Research suitable power source options
August 2022	- Research: which PCB software is best? - Test different power source options - Which sensors are needed?	- Assembled chassis with servos and motors - tested various	- Find suitable distance sensor - start PCB design

	- Which Microcontroller?	power source options, including: power banks, 2x 18650 and 2S Lipo cells - Research about distance sensors	
September 2022	- Intensive integration testing of motors and power supply - PCB prototyping using perfboard	- finished PCB prototype - integration tested motors with chassis and PCB	- start actual PCB design - design
October 2022	- create EasyEDA account - start PCB schematic	- finished schematic - tested chassis + motors (ramps, seesaws, speed bumps, debris, point of rotation)	- start PCB routing - research: design architecture for main program
November 2022	- finish PCB - order PCB - Research: fast, but affordable PCB manufacturer - write main routines and functions - create new github repo	- routed and ordered PCB (jlcPCB) - created repo	- test and assemble PCB ASAP - finish hardware (design and print remaining sensor mounts)
Dezember 2022	- integration test PCB - finish hardware	- soldered and tested PCB - printed and mounted last 3d printed parts	- test robot as a whole (PCB, chassis) - software prototyping
January 2023	- write linefollowing routine - test linefollower	- wrote and tested linefollowing - tested NN approach for intersections, worked not as well as our algorithm from last year	- improve intersections (use gyroscope to turn, align to intersection before turning) - rescue area - obstacle
February 2023	- order replacement parts - finish rescue area - create ml data for victims - label ml data - train victim NN, research about cloud computing - train silver NN - finish and test obstacle - improve intersections (use gyroscope to turn, align to intersection before turning)	- linefollowing done - worked on silver detection using tensorflow library - bought replacement Raspberry Pi, Teensy Microcontroller, Step up/down modules and motors	- finish rescue area - verify victim NN performance “in the real world” - test under competition conditions

		- trained victim NN using google collab to facilitate collaboration within the team	
March 2023	- write packing list for German Opens - last tests	- wrote packing list - all tests successful	- program exit (after evacuation zone)
April 2023	- German Opens	- German Opens	- redesign gripper to use DC motor instead of servo (should work more reliable) - increase linefollowing speed - redesign PCB using better step up/down modules and Arduino Nano instead of Teensy as its easier to buy nowadays and more reliable - decrease overall chassis size
May 2023	- redesign gripper to use DC motor instead of servo (should work more reliable) - increase linefollowing speed - redesign PCB using better step up/down modules and Arduino Nano instead of Teensy as its easier to buy nowadays and more reliable - decrease overall chassis size	- redesigned gripper to use DC motor - new PCB design - designed new, smaller chassis	- update old 3d files - assemble PCB - test PCB - complete hardware of robot
June 2023	- design new mounts etc due to new chassis - solder PCB - intensive testing - create more ml data for victims - label new data - train new model - World Cup registration and hotel booking - create Poster about robot - write TDP	- finished PCB - redesigned and printed mounts for camera and VL53L0X distance sensors - redesigned and printed BNO055 mount - redesigned victim container - competition simulation - booked hotel - registered team and mentor	- write “packing list” for World Cup - print replacement parts

		- wrote TDP - created and printed poster	

Appendix
For further information about our development process, please do not hesitate to check out our GitHub repository:

https://github.com/saegersven/robocup23