DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
THE UNIVERSITY OF TEXAS AT ARLINGTON

PROJECT CHARTER
CSE 4316: SENIOR DESIGN I
SPRING 2017

The Taraminator
By Visioneers

VISIONEERS
TARAMINATOR

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Revision History

Revision	Date	Author(s)	Description
0.1	02.26.2017	JH, DS, MS, SO, SS BG	document creation

CONTENTS

List of Figures

1 Vision

Our vision is to make RGB-D technology accessible for any individual or organization interested in computer vision and exploring its applications in industry. The core of the vision is to create an open-source API that works with the Tara Development kit, and potentially other stereo camera units.

2 Mission

We will achieve our vision by utilizing OpenCV and the Tara Development kit to make an open source API using the GitHub platform. Our mission can be defined through the following functionality below:

- Data gathered from the camera shall be transferred through ethernet or through WiFi.
- The computability and performance of the algorithms shall not exceed or reach exponential time.
- The API will allow the integration to transfer data through ethernet, generate a disparity map, and allow developers to create a point cloud
- A point cloud can be used to view objects on a 3D plane and an algorithm can detect which points make up the object(s) being viewed
- Along with the point cloud, the libraries will have functionality to visualize depth and gather distance data.
- The open source API will be accessed through Github and maintained by the community and development team
- API will provide a way for developers to have open source access to computer vision libraries to camera
- The ethernet protocol will stream data packets which contain points gathered from the camera to a separate machine

3 Success Criteria

The success of the project will be measured and determined by meeting the following criteria:

- Our measure for success is delivering a product that is functional, scalable to various cameras, and ultimately utilized by hobbyist or organizations.
- The open source API shall add robust libraries that can improve performance of many robotic applications, camera applications or other computer vision applications
- the API shall make the computer vision field even more accessible to people who may want to utilize depth cameras in their projects. A bigger community means more involvement in development

4 Background

Computer vision opens the doors for new tangible innovations that involve object detection, dimension calculation and calculating distance in objects. Computer vision has applications in many industries, such as manufacturing, transportation, retail and many others.

5 Related Work

Discuss the state-of-the-art with respect to your product. What solutions currently exist, and in what form (academic research, enthusiast prototype, commercially available, etc)? Include references and citations as necessary.

6 System Overview

The open source API will be structured around the Tara development kit. This kit has an SDK which has embedded OpenCV libraries that will be built upon. Information gathered by the camera will be transferred through USB to an onboard computer. From there, the computer board will run a computation on the data points gathered. The information that is calculated will be sent through ethernet or wifi depending on the developers choosing. The end machine will then use that data to provide an input for an action or otherwise.

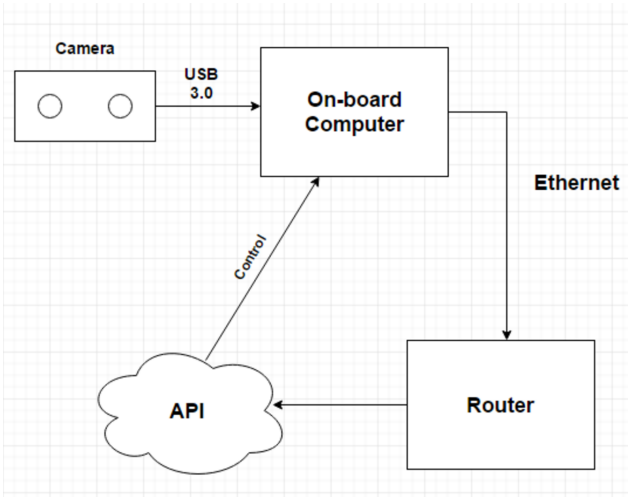

Figure 1: System Overview - Ethernet

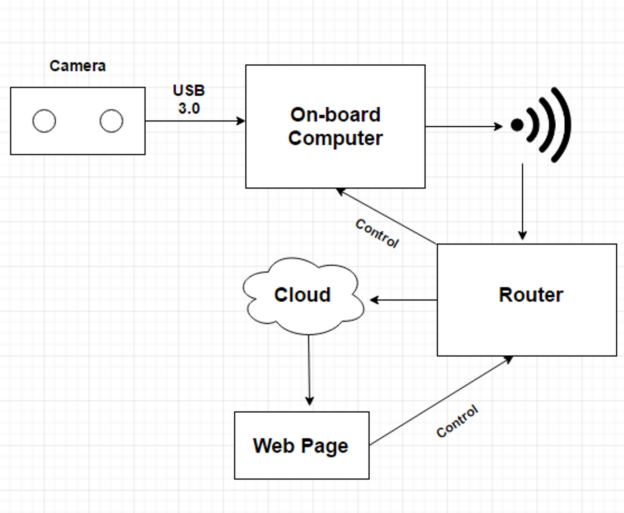

Figure 2: System Overview - Wifi

7 Roles & Responsibilities

Justin Hancock

1. Software Developer
2. Development Team

Mitchell Shelton

1. Software Developer
2. Development Team

Daniel Stenbro

1. Software Developer
2. Scrum Master

Shervin Oloumi

1. Product Owner
2. Computer Engineer

Biplow Ghimire

1. Computer Engineer
2. Development Team

Dr. Chris McMurrough

1. Sponsor

8 Facilities & Equipment

The University of Texas at Arlington provides a wide range of tools and equipment. For this project we will be utilizing a Nvidia Jetson TX1 provided by the university to do the point cloud generation. We also are allowed office space to meet and work on the project on campus. Other equipment include access to a 3D printer as well as access to a laser cutter.

9 Cost Proposal

9.1 Cost Proposal

The open source API requires a platform to develop on. For this, the Tara development kit allows us to build upon an existing device and develop algorithms based on any kit. The kits cost is 250 dollars plus an computer board called the TX1. The TX1 grants more computability for any data that requires compression or any action that requires more resources. The cost of the TX1 is around 580 dollars. The total cost for this project for all materials for testing and development is 830 dollars.

9.2 Preliminary Budget

- USB 3.0 Hub - 10 dollars
- Micro-USB to USB adapter - 5 dollars
- Tara RGB-D Camera - 250 dollars
- Tripod - 3D Printed
- Nvidia Jetson TX1 - Provided
- Nvidia Jetson TK1 - Provided
- Raspberry Pi 3 - Provided
- Dell Computer - Provided
- Orbitty Carrier - Provided

9.3 Current & Pending Support

The current support is the 800 dollars provided by the University of Texas at Arlington, and we do not have pending support at this moment.

10 Documentation & Reporting

In this section, you will describe all of the various artifacts that you will generate and maintain during the project lifecycle. Describe the purpose of each item below, how the content will be generated, where it will be stored, how often it will be updated, etc.

10.1 Project Charter

The project character shall be a key for document for our project. This document defines the objectives, scope and structure for the design but also will give us a way to track the development life cycle of the project.

10.2 Product Backlog

The Product backlog will establish the initial requirements for the Open source API. All team members are responsible for checking the backlog for updates and changes.

10.3 Sprint Planning

All members of the team are required to attend to every sprint-planning meeting. The meetings will focus on completing tasks that will further progress the project. All documents will be updated if necessary during sprint-plannings to keep all tasks clear and concise for each following sprint. The team will also define the sprint backlog and set the schedule for the sprint. Each sprint will be between 2 to 4 weeks.

10.3.1 Sprint Goal

The sprint goal is a description of what the team will be working in that sprint. This enables all members of the team to assign each task and near the end of the sprint describe what tasks were accomplished.

10.3.2 Sprint Backlog

The sprint backlog is a list of tasks defined by the Scrum Master during a sprint team meeting. The tasks are split and assigned to each team member based on their strengths. This ensures that there will be progress towards the goal of each sprint. Each team member will the track the amount of hours on each tasks. New items will be added to the backlog for future sprints.

10.3.3 Task Breakdown

In order to complete certain tasks of the sprint backlog, the tasks will be broken down into small subtasks. Splitting the workload will ensure each team member will complete their assigned work to the best of their abilities. Each individual is also responsible for researching and getting assistance if needed. The team will meet semi-weekly to ensure that all members are on track towards the sprint goal.

10.4 Sprint Burndown Charts

The burndown charts will be a document that graphically display how the sprint is progressing. A spreadsheet will be used to each track of each team member and how their progress is going. In order to keep track of the sprint goals efficiently, a Google Drive folder will be used to store all the charts for each sprint.

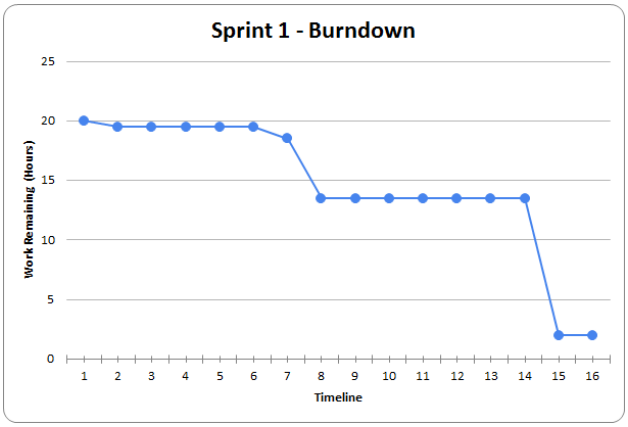

Figure 3: Example sprint burndown chart

10.5 Sprint Retrospective

During the sprint retrospective, the Scrum Master will debrief the team on the previous sprint session. The discussion will include improvements that could be made and other issues that need to be addressed if necessary. This will help ensure that future sprint will be more productive and successful.

10.6 Individual Status Reports

Throughout the project , each team member is required to complete an individual status report. Each individual team member will record the tasks they have completed or are currently working on, the number of hours spent on each tasks and their future plans for the next sprint. If any unexpected tasks occurs , it will also be records.

10.7 Engineering Notebooks

Each team member will have an engineering notebook on hand at all times. This will allow any ideas that come up during the project to be documented. This document can also be used to track time and the overall life cycle of the software.

10.8 Closeout Materials

10.8.1 System Prototype

The Tara Development Kit will be used as a prototype. This will allow the team to demonstrate the API libraries during each sprint effectively to an audience.

10.8.2 Project Poster

The project poster will be a display item that can easily describe each feature of the project. All team members will be listed and also show what the API can do for any camera on the market including the Tara Development Kit.

10.8.3 Web Page

The web page will be an HTML document that describes all features of the open source API. This document will be open the public for everyone to read and get more information about what the API can do for their camera implementation.

10.8.4 Demo Video

10.8.5 Source Code

The source code will be provided on Github and placed on the project web page. GitHub allows open source projects to be easily assessable.

10.8.6 Source Code Documentation

The team will keep detailed documentation in the source code for the project. The purpose of the source code documentation is to explain the functions. This will allow future developers to easily implement the open source API into their own source code.

10.8.7 Hardware Schematics

10.8.8 CAD files

10.8.9 Installation Scripts

10.8.10 User Manual

REFERENCES

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[2] Rubin, Kenneth S *Essential Scrum: A Practical Guide to the Most Popular Agile Process*. Addison-Wesley, Professional,2012

[3] e-con Systems.com *USB Stereo Camera | 3D Depth Camera(OEM), 2017*. https://www.e-consystems.com/3D-USB-stereo-camera.asp