Department of Computer Science & Engineering
The University of Texas at Arlington

Project Charter
CSE 4316: Senior Design I
Fall 2021

Calendar Vision
Digilog Calendar

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Revision History

Revision	Date	Author(s)	Description
0.1	10.01.2021	ER, DS, SK, HL, JE	Document Creation

CONTENTS

List of Figures

1 Problem Statement

Organization is critical to those who have busy lives and numerous tasks to fulfill each day, Many people enjoy having a physical calendar; however, with the rise of technology, digital calendars have become the new standard when it comes to planning. This new implementation is great; however, with these new digital calendars, a majority of a person's personality is lost–their handwriting, their random drawings and doodles, etc...

2 Methodology

We will be building a mobile application that will allow the user to transfer all of their data from an analog calendar to a digitized version of that calendar using computer vision. The user will also be able to keep track of any changes that they have made on the Digilog with a reminder to apply those changes to the analog calendar. Furthermore, the calendar will also apply updates made to the analog calendar to the digital calendar–such as completing a task. The application will have basic calendar features as well such as reminders, log in information, and the ability to share events with friends and family.

3 Value Proposition

By completing the project, DigiLog, will grab attention of many potential users who are struggling with managing their analog calendar, or who want to keep their schedule on their phone. The application will generate sales and provide a great source of new material for a company's content strategy. Calendars are already a key factor of almost everybody's lives. With the development of this application, DigiLog will improve the quality of daily life.

4 Development Milestones

This list of core project milestones should include all major documents, demonstration of major project features, and associated deadlines. Any date that has not yet been officially scheduled at the time of preparing this document may be listed by month.

Provide a list of milestones and completion dates in the following format:

- Project Charter first draft - Oct 2021
- System Requirements Specification - Nov 2021
- Architectural Design Specification - Nov 2021
- Detailed Design Specification - Nov 2021
- Demonstration of image splicing - Dec 2021
- CoE Innovation Day poster presentation - Apr 2022
- Demonstration of text recognition and application basics - Mar 2022
- Final Project Demonstration - May 2021

5 Background

This is a sponsored project–the idea came from Tyler Harrist and Kevin Tung. To summarize the issue at hand, many people rely on calendars in order to stay on schedule and complete their tasks. There are mainly two kinds of options when it comes to form of calendar, either a digital calendar on their mobile device or a physical paper calendar. Each form comes with its own benefits; however, users typically only choose one since it can be tedious having to copy everything from one calendar to the other. There is, however, a possibility for the user to digitize their physical calendar which will save them time and allow them to have both forms of calendars available to them.

When searching through the app store for a calendar, there are numerous options that come up and many of those applications seem great according to their ratings on the play store; however, we cannot seem to find any applications that take the data from the calendar and transfer it to a digital version via computer vision alone. Those applications all require the user to either use a special pen or a calendar manufactured by the seller that comes with QR codes that assist the application with determining the month. If our team manages to create this application without the use of special equipment, then there will possibly be a great profit since other users already do not mind paying for the equipment required to make this process possible. The app could either be sold at a set price or sold as a subscription. It is possible, however, that we may end up incorporating QR codes for our product as well.

As for our relationships with our sponsors, we do have an academic relationship with one of our sponsors, Keving Tung, who graduated from The University of Texas at Arlington a year and a half ago. Other than that, we do not know much about them as we are still working on meeting with them. Furthermore, we have not been informed as to why our customers specifically want this application made for them; however, it is clear that the development of this application will be of great use to both our customers and other users alike.

6 Related Work

As mentioned in the Background section, there are numerous applications that appear in the app store when we search for calendar related applications. This number of applications gets drastically reduced when we search for applications that allow the user to take images of their analog calendar and digitize the contents onto their calendar on their phones. There is a handful of applications that allow the user to do so, but they all require some form of external assistance.

To start off, there is a company called Neo Smartpen that sells products that make the digitization of paper written notes/calendars possible, more information can be found in the following website [1]. The client must purchase a special pen along with a compatible notebook also sold by the seller that will allow the user to take advantage of their application. There are several pen options available with prices varying from around $60 up to $170. The manufacturer also states that some pens may not be compatible with certain notebooks. As for the notebooks and planners, the prices vary from $5 up to $30. If a client has the money to spare on the pen, then this would be a great option; however, not every client has the privilege of purchasing such an expensive piece of equipment. Furthermore, the cost will continuously rise as the client continues purchasing the calendars and planners sold only by the manufacturer. Another very similar that we disovered in [5] is the Moleskine smart planner that allows the user to convert their handwriting into calendar events. Similarly, the client has to purchase a special pen that is priced at $200 and a separate planner that will cost about $30. Now, lets switch over to products that do not require a pen. We will look into the Oganicer, which is a smart planner that uses QR code technology to link the specific calendar dates in the notebook with the digital dates. The Organicer notebook does not require a "special pen" like the other notebooks and it is priced at around $40, which is a step up when pitting it up against the competitors since the cost per notebook is around the same, but this one does not require an expensive pen [4].

Another somewhat similar product is the WritePad [3], which is an application that allows the user to "hand write anywhere on a document page" and the application will automatically convert the hand written input to digital text. This application is not quite like the others; however, it does incorporate technology that will convert written text to digital text. It does not have anything to do with planning and calendars; however, a portion of the steps used by this app will likely be used by us as well.

Lastly, there is the PolyCalendar [2] application that can be found in the Apple app store. This application has the user write their tasks on the calendar with a stylus and it will then transfer their information to the application. This is a step up of the WritePad app, but it is still not quite what the sponsors of this project want since they want to have the ability to write on a physical piece of paper and then transfer the data to the application.

7 System Overview

This is a computer vision based project. One of the main features on our project is detecting a grid from an analog calendar. There are many object detection models that we can implement such as OpenCV or YOLOv5. Choosing the optimal program and model will pose to be our greatest problem, as it will require a large amount of research and test cases to find the ideal solution. As of right now we're only intend to implement this application on Android and iOS

One of the benefits of using this application is user friendliness and the ability to synchronize with the calendar application on your smart phones

Figure 1: Screen shot the calendar on your smart phones

After you scan the physical calendar, the software will able to slice the segments into pieces based on month/day as Figure 2.

Figure 2: Daily tasks after separated by date

Each component will then be linked to a corresponding date on the Digilog and the information will be digitized and listed under that date as shown in Figure 3.

One of the major functionalities of the application is that you can update your new plans through DigiLog and an alarm will be made to remind the user to make the changes on their analog calendar as well. Furthermore, the user will have the ability to share their calendar with other users as well.

Figure 3: Daily tasks after separated by date

This is our diagram of major components.

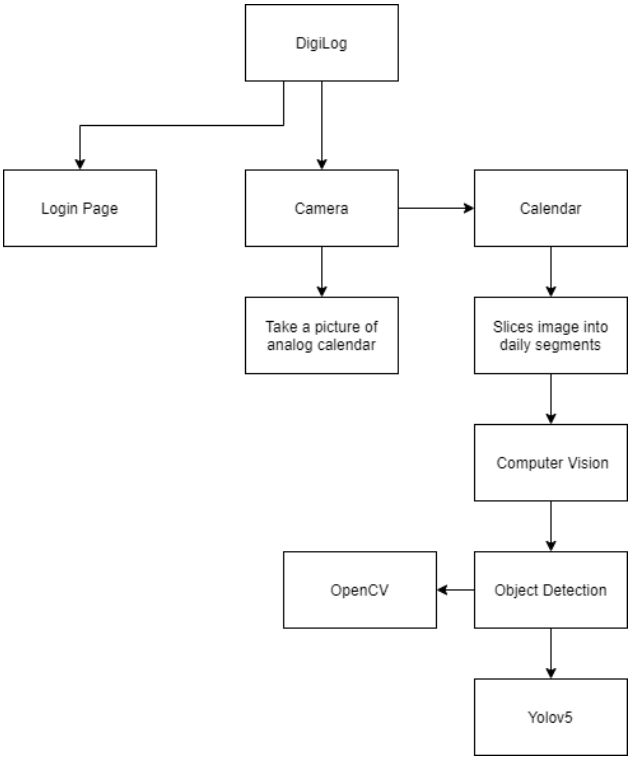

Figure 4: Diagram of major components

8 Roles & Responsibilities

The stakeholders for our project are our future end users, us as the developers, and our sponsors, Tyler Harrist and Kevin Tung.

Our team members are Eliseo Ramirez, Dalton Sparks, Joshua Elledge, Huy Lam, and Seonyoung Kim. Dalton will contact the sponsors to set up the meeting or ask questions. Eliseo is a product owner, and he is responsible for prioritizing the tasks. Seonyoung is a scrum master and responsible for establishing scrum and fostering an effective working environment. These roles will be changed periodically every month.

9 Cost Proposal

We do not expect to spend much money, if any at all, since there are several platforms for app development that are free and OpenCV, which we will use to segment the calendar images and convert the text to digital data is also free to use. If the scenario in which we cannot link the date information in the calendar with its digital counterpart, we may make use of QR codes that will simplify the task, but the cost for that should not exceed $100 for our development purposes.

9.1 Preliminary Budget

Name	Cost
One-time fee to publish an app on Google Play Store	$25
Initial filing of copyright app	$50 – $65
Apple Developer Program for submitting an app to the App Store	$99/*year*

9.2 Current & Pending Support

- Sponsors(Tyler Harrist and Kevin Tung)

10 Facilities & Equipment

We do not need any specific equipment to implement the project. We will use personal laptops for research and app development. For the team meeting, we will use our lab space(ERB 208), or go to the library at Nedderman Hall or Central Library.

11 Assumptions

The following list contains critical assumptions related to the implementation and testing of the project.

- The calendar will be successfully spliced and the month and days will be read correctly allowing us to avoid the use of QR codes
- The text recognition software will be capable of reading a wide variety of handwriting styles
- The entire team's devices should be capable of running the software that will be used to develop this application
- The camera quality of the user's devices will be sufficient for the application to digitize their calendars
- Should the Covid Pandemic get worse, the completion of the project should not be affected since it is all software and we can simply meet online for our discussions

12 Constraints

Constraints are limitations imposed on the project, such as the limitation of cost, schedule, or resources, and you have to work within the boundaries restricted by these constraints. All projects have constraints, which are defined and identified at the beginning of the project.

Constraints are outside of your control. They are imposed upon you by your client, organization, government regulations, availability of resources, etc. Occasionally, identified constraints turn out to be false. This is often beneficial to the development team, since it removes items that could potentially affect progress.

The following list contains key constraints related to the implementation and testing of the project.

- Final prototype demonstration must be completed by May 1st, 2021
- Total development costs must not exceed $800
- Lighting could affect the application scanning process, so warnings should be given if the lighting conditions are not met
- Users' storage/software must meet the application requirements prior installation
- Unable to detect data when the note is written over the line of the segment

13 Risks

The following high-level risk census contains identified project risks with the highest exposure. Mitigation strategies will be discussed in future planning sessions.

Risk description	Probability	Loss (days)	Exposure (days)
Inability to link dates on calendar may lead to the use of bar codes	0.40	40	16
Data misinterpretation with users who have sloppy handwriting	0.40	20	8
High user volume may cause instability	0.40	15	6
Security Breaches	0.30	10	3
Denial to publish application	0.10	15	1.5

Table 1: Overview of highest exposure project risks

14 Documentation & Reporting

14.1 Major Documentation Deliverables

These deliverables are major grade components of the course. Completing these documents should generally be the sprint goal during the applicable sprint period. Refer to current and previous course syllabi and schedules to estimate the due dates of these items. Remove this explanatory paragraph from your draft, but leave the heading.

14.1.1 Project Charter

Every change and updates will be noted and will be discussed during the team meeting. Then, it will be updated every end of the sprint. The initial version will be delivered by October 11th, and the final version will be delivered before we publish an app.

14.1.2 System Requirements Specification

Every change and update will be noted and will be discussed during the team meeting. Then, it will be updated every end of the sprint. The initial version will be delivered by November 5th, and the final version will be delivered before the end of the semester(Fall 2021).

14.1.3 Architectural Design Specification

Every changes and updates will be noted and will be discussed during the team meeting. Then, it will be updated every end of the sprint. The initial version will be delivered by November 15th, and the final version will be delivered before the end of the semester(Fall 2021).

14.1.4 Detailed Design Specification

Every changes and updates will be noted and will be discussed during the team meeting. Then, it will be updated every end of the sprint. The initial version will be delivered by November 15th, and the final version will be delivered before the end of the semester(Fall 2021).

14.2 Recurring Sprint Items

Source code and meeting times will be documented and maintained during each individual sprint

14.2.1 Product Backlog

The product backlog will be created based on the conversation with our sponsors. Items will be prioritized through the discussion and group vote with the team. Our team will use Slack to maintain and share the product backlog with our sponsors.

14.2.2 Sprint Planning

We will meet before starting a new sprint to plan things that need to be done during the sprint. We will have 4 sprints for the fall semester.

14.2.3 Sprint Goal

We will decide the sprint goal as a team.

14.2.4 Sprint Backlog

We will decide who will take care of what items go into the sprint backlog before we start each sprint. The backlog will be maintained using a scrum board

14.2.5 Task Breakdown

It will be up to each individual team member to voluntarily claim what tasks they want. The time spent on a task will be recorded in the engineering notebooks and the individual status reports.

14.2.6 Sprint Burn Down Charts

Huy Lam is responsible for generating the burn down charts for each sprint. He will create the table to get an actual effort from each member. Then, he will get the total of actual effort and put it on burndown chart.

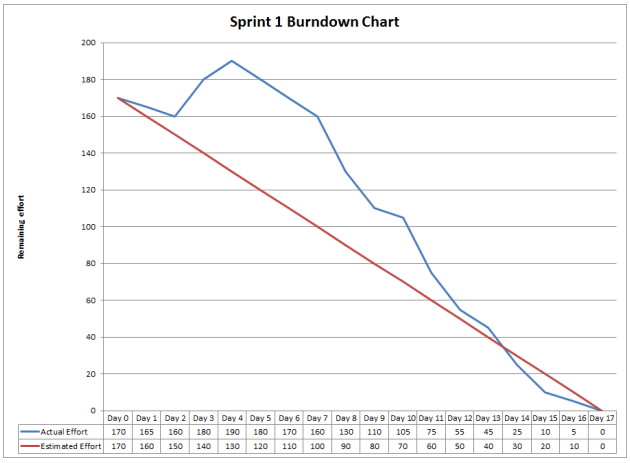

Figure 5: Example sprint burn down chart

14.2.7 Sprint Retrospective

We will have sprint retrospective at the end of each sprint as a team. We will document major details/updates on each sprint as a team and small tasks will be documented as individuals. It will be due before the next sprint.

14.2.8 Individual Status Reports

All team members will make a status report every three weeks of what they have worked on. Each report will contain the goal, backlog, time expenditures, burndown chart, individual retrospective, and perr review.

14.2.9 Engineering Notebooks

Engineering notebooks will be updated at a minimum each lab meeting. Each team member will sign each others notebook as a witness of what was covered or Professor Conly will sign in the unlikely event that no team members are present.

14.3 Closeout Materials

The application will be provided to the customer upon project closeout along with the Project Charter and SRS documentation.

14.3.1 System Prototype

The rough draft of the application will be included in the prototype. It will be demonstrated to the sponsors until all requirements are satisfied.

14.3.2 Project Poster

All the core details of the application will be included on the poster and will be delivered during the demo.

14.3.3 Web Page

The information on how we developed the application will be provided in the project web page as a closeout.

14.3.4 Demo Video

Examples of the application being used will be shown in the demo videos. The videos should be no longer than a few minutes.

14.3.5 Source Code

Source code will be shared with the sponsors and maintained in Slack and in google drive.

14.3.6 Source Code Documentation

GitHub

Source code will be document through GitHub

14.3.7 Hardware Schematics

This project is purely software.

14.3.8 CAD files

This project is purely software.

14.3.9 Installation Scripts

There will be a instructions on how to install the applications. Unless it is uploaded to the app store customers will then simply be able to install the software from the app store

14.3.10 User Manual

There will be instructions within the application.

REFERENCES

[1] N2 User Guide.

[2] PolyCalendar 2017 - Schedule and Handwriting -.

[3] WritePad for iOS & Android Turns Your Handwritten Notes to Digital Text, May 2014.

[4] This Smart Planner Lets You Switch Seamlessly Between Handwritten and Digital Notes, October 2018.

[5] Mara Leighton. Moleskine's smart planner turns your handwriting into iCal and Google Calendar events â and it really works.