

Project Plan for THE IMPLEMENTATION OF DRONES IN AGRICULTURE

by

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Distribution:

A research proposal is submitted in partial fulfillment of the requirements for the bachelor's degree in Computing at the Belgium Campus

The first draft document is subjected to changes!

Appendices:

<Appendix 1>

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1. Overview

Farming operations now are considerably different from those of only a few decades ago. Precision agricultural methods, which may assist farmers in making more informed decisions, have advanced greatly in recent years, with the worldwide industry currently expected to reach \$43.4 billion by 2025. (Pinguet, 2021) Thanks to innovative technology, farmers can now optimize every element of their operations, from field spraying to grow cycles and crop health. Drones and other unmanned aerial vehicles have been crucial in this change (UAV). Farmers may get an in-depth data analysis, mission planning, and new technology that can manage physical activities with an agriculture drone. Whether you're a small-scale farmer or the CEO of a huge corporation, drone technology may help you meet your harvest goals and produce more crops with fewer resources. Effective crop spraying and field mapping are two crucial areas where the right UAV and payload may help. Any grower will find it challenging to efficiently utilize the above. If you spray too much concentrated in one spot, you may pay additional expenses and even reduce the quality of your crop. If the concentration is too low, your crops may be swamped by weeds, famished, or consumed by insects and other predators, resulting in poor yields. However, the correct farming drones and spraying payloads can uniformly and efficiently spread pesticides. The results. Improved crop quality and yield rate without the need for heavy physical work. Drones from DJI may be utilized on almost every crop, including rice, wheat, corn, citrus trees, cotton, and many more. This proposal will handle how our modified DJI Tello Drones will improve our current farming system. Drones are becoming increasingly popular among farmers, and for good reason. We add extra features to the base drone that will add to its value for these farmers. Drones can deliver aerial footage of practically anything from almost any location. This enables farmers to keep an eye on the skies practically anywhere on their farm, regardless of how difficult the terrain is. This can be especially useful for locating animals and detecting dead patches in crops that a typical on-the-ground eye would not have noticed.

2. Goals and Scope

2.1 Project Goals

Project Goal	Priority	Comment/Description/Reference
Functional Goals:	1	For details see the Project Requirements Specification 0
The drone can survey areas		Determine the landscape of the field/ bush scanning for livestock and or scanning the crops
Drones able to identify livestock		Using cameras to identify lost animals around the property.
Database connection to interface		The connection between the drone that shares its with a to a user where inputs the data into a database
Drones can tend to crops.		Includes spraying of Fertilizer, Herbicide, Fungicide, Pesticide, Seeds, Desiccants
Drone battery level		If the battery reaches a certain point drone will auto return to dock so that the drone doesn't fall in the field to prevent damages.
Business Goals:	4	
Different from competitors		A database is implemented to store related data in different categories as well as identify areas of concern for the farmer/user.
Cost-effective		The product should be cost-effective time as possible to be used in rural areas by the less fortunate
Technological Goals:	3	
Recoding of the drone		Recreating the app adding the user interface and linking the database
The drone can access camera		In the use of search and rescue
Implementing a interface		User friendly interface to control the drone.
Software and firmware updates		Drone able to access all the new mods for it
Quality Goals:	2	
Lightweight but sturdy		The drone should be able to withstand strong winds and weather
Human error		Reducing the errors brough in by users
Constraints:	5	
Environment		The drone can withstand winds up to a certain knot speed
Users		Users not schooled enough to handle the application and work the drone

2.2 Project Scope

Drones will be created assisting in agriculture by identifying hot spots in the field where areas of concern exist, as well as searching for and assisting in the rescue of lost animals on the land or farm. All of this information will be sent to a database so the farmer can easily track what has been done.

2.2.1 Included

Support manual a user-friendly start-up guide will be provided with videos of troubleshooting and a user manual.

2.2.2 Excluded

User training will not be provided

3. Organization

3.1 Organizational Boundaries and Interfaces

The project is made up of an independent body of students collaborating under the supervision of Mr. Ngoveni, he will act as our liaison towards the parent company Belgium Campus. Our customer base would form part of the agricultural sector where we'd be working on improving numerous aspects of the industry. As such, they would be affected the most by our results as they would be the ones relying on our success.

We have a retail supplier RyzeRobotics, this partnership will lead to us using them as a supplier for our Tello drones.

We do not currently have subcontracts.

3.1.1 Resource Owners

All of the resources are owned by either Belgium Campus or the students participating in the project. As such managerial roles will be split between the parties with an understanding of trust where all parties ensure any resource that may be required and dedicated is in working order. This ensures that the owner of a resource has full control over his belongings. Any other party that may get added to the organizational structure such as a subcontractor would also adhere to these conditions and would thus retain control over resources.

3.1.2 Receivers

The responsible party for receiving the project after completion will be Mr. Ngoveni.

3.1.3 Sub-contractors

We currently have no subcontracts. But this could change with future cloud infrastructure.

3.1.4 Suppliers

Company: Contact	Deliverable	Comment
RyzeRobotics: https://www.ryzerobotics.com/	Tello mini drone	They make commercial drones with DJI.
-	-	-

3.1.5 Cross Functions

Function	Dept.: Contact	Responsibility/Comment
Product Mgmt	Students	The group of students will cooperate to fulfill the roles of the project.
Drone Software Dev	Students	The group of students will cooperate to fulfill the roles of the project.
Research	Students	The group of students will cooperate to fulfill the roles of the project.
Product Testing	Students	The group of students will cooperate to fulfill the roles of the project.
App Software Dev	Students	The group of students will cooperate to fulfill the roles of the project.
Drone Modification	Students	The group of students will cooperate to fulfill the roles of the project.
Documentation	Students	The group of students will cooperate to fulfill the roles of the project.
Oversight / Supervision	Nsuku N. Ngoveni	Will act as our supervision.

3.1.6 Other Projects

Project	Org.: Project Mgr	Dependency	Comment
Undefined.	-	-	-

3.2 Project Organization

3.2.1 Project Manager

Role	Organization: Name
Project Manager	Nsuku N. Ngoveni
Technical Project Mgr.	Students

3.2.2 Project-internal Functions

Function	Organization: Name	Comment
Product Mgmt	Students	
Drone Software Dev	Students	
Research	Students	
Product Testing	Students	
App Software Dev	Students	
Drone Modification	Students	
Documentation	Students	

3.2.3 Project Team

Name and Surname	Role	Comment
Bubele Lilitha Malotana	Contributor	
Elmar Jacobs	Project lead	
Frans Rosslee	Project Lead	
Janco Botes	Contributor	
Luan Bosch	Contributor	
Nsuku N. Ngoveni	Supervisor	
Tiaan van Staden	Contributor	

3.2.4 Steering Committee

The Steering Committee (SteCo) of the project is responsible for the oversight of the overall progress and completion of the project.

The SteCo consists of the following members:

Organization	Name	Comment
Belgium Campus	Nsuku N. Ngoveni	Main Supervisor.
Belgium Campus	Anila Joy	Reserve Supervisor.

4. Schedule and Budget

4.1 Product Breakdown Structure

Drone: Mini Tello Work Breakdown Structure

Phase 1: Pre-planning

Phase 2: Project Start

Phase 3: Analysis of the drone

Phase 4: Design of app and drone systems

Phase 5: Deliverables Development

Phase 6: Implementation of Module 1

Phase 7: Deliverables Development: CMS Intro Module & Module 2

Phase 8: Implementation of Module 2

Phase 9: Instructional System Evaluation

Phase 10: Evaluation

Phase 11: System Demo and Customer Review

Phase 12: Project Close-Out

4.2 Work Breakdown Structure



Work Breakdown
Structure.docx

4.3 Schedule and Milestone

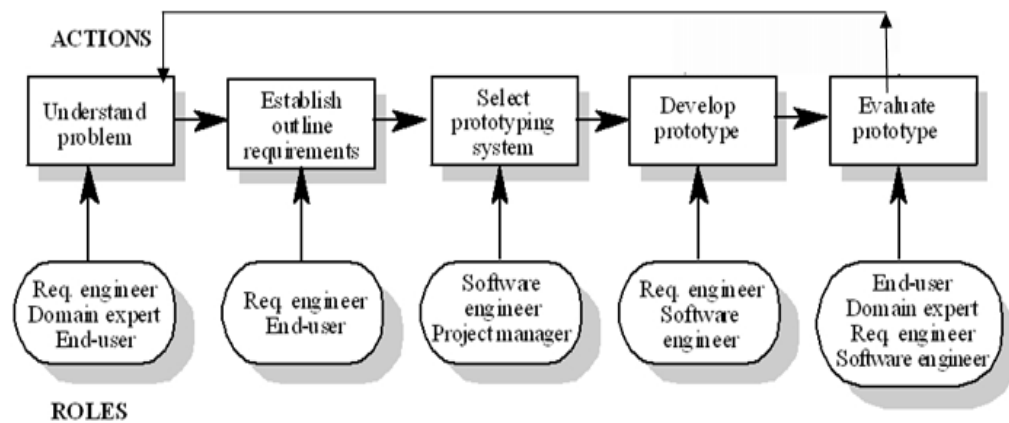
Milestones	Description	Milestone Criteria	Planned Date
M0	Project proposal	Budget Release	2022-05-05
	Project goals, budget, and scope defined	This proposal will handle on how DJI Tello Drones can improve our current farming system.	2022-05-16
M1	Project Plan Template		2022-07-01
	Organization and Schedules	Scope and goals described	2022-07-04
M2	Creating a Database		2022-07-04
	An expected DB should be provided to be used in the project.	Requirements agreed, project plan reviewed, resources committed	2022-07-04
M3	Business Logic		2022-07-04
	Functions and the back end of the project should be discussed and developed.	Architecture reviewed and stable	2022-16-04
M4	User Interface		2022-16-04
	As we are working on a drone a UI should be developed from where the drone can be controlled.	Coding of new functionality finished, Draft documentation	2022-30-04
M5	Business Logic creation		2022-30-04
	The Logic layer as discussed in M3 should be a functional system by this milestone.	Product system tested, documentation reviewed	2022-07-08
M6	Functional Requirements		2022-07-08
	Start development on functional requirements to improve software/hardware.	Coding of new functionality finished, Draft documentation	2022-16-08
M7	Functional Requirements		2022-16-08
	Further development on functional requirements of software/hardware.	Coding of new functionality finished, Draft documentation	2022-09-09
M8	Functional Requirements		2022-09-09
	Polishing of functional requirements for software and hardware.	Coding of new functionality finished, Draft documentation	2022-16-09
M9	Completed Project and Presentation		2022-16-09
	Presentation of the final project solution to the supervisor.	Architecture reviewed and stable	2022-11-11

4.4 Budget

Category	Budget for Period in ZAR							
	M0-M1	M1-M2	M2-M3	M3-M4	M4-M5	M5-M6	M7-M8	M9
Human Resources (internal)	0	0	0	0	0	0	0	0

Category	Budget for Period in ZAR							
	M0-M1	M1-M2	M2-M3	M3-M4	M4-M5	M5-M6	M7-M8	M9
Human Resources (external)	0	0	0	0	0	0	0	0
Purchases (COTS)	0	1000	5440	5440	0	0	0	0
Equipment	0	0	3000	2700	4500	3800	0	0
Premises	0	0	0	0	0	0	0	0
Tools	0	0	0	0	0	0	0	0
Travel costs	0	0	0	0	0	0	0	0
Training	0	0	0	0	0	0	0	0
Review activities	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0
Total	0	1000	8440	8140	4500	3800	0	0
Total cumulated	0	1000	9440	17580	22080	25880	25880	25880

4.5 Development Process



4.6 Development Environment

Item	Applied for	Availability by
Methods		
Lens installing	Installing an infrared lens on the drone	M0
Tag pairing	Pairing tags with the drone	M1
Perfect flying controls	Perfecting drone controls and flying ability	M1
Tools		
Eclipse	Java IDE for adding web-based features.	M1
TELLO app	Flying and controlling the drone	M0
Visual Studio	IDE for adding UI features	M0
Languages		
C#	UI design	M2
Java	Methods and new features for drone	M2
JavaScript	App editing and web-based controls for the drone.	M2

4.7 Measurements Program

Type of data	Purpose	Responsible
Change in project requirements	Capture and change the project to fit new requirements.	Management team
Detecting defects	To prevent any defects before release.	Test lead
Range test	Testing and expanding the range on the drone.	Test lead
Durability	Getting durability of drone in tough conditions	Test lead
Lens quality	Added lenses to be tested	Building team
Tag reader range	Testing and expanding the range of the drone.	Test lead
Failures	Capturing failures in the drone to prevent them from happening again and to remove them completely.	Building team

5. Risk Management

Risk management is the identification, assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events. Any changes made in the organization which contradict the assumptions made can be accommodated with minimal changes in the code.

Possible risks and mitigation or avoidance strategies: -

1. Disk failure – all project deliverables and documents will be stored in each team member's machine.
2. Any team member leaves – his work will be reassigned among others.
3. Lack of skill – To avoid this platform and language is chosen in which all team members are comfortable (Java).
4. Poor Quality – From time to time we will ensure that the project is doing the specified task properly and efficiently.
5. Project not completed in time – We have developed a plan to complete the project in time which will be followed strictly.

6. Sub-contract Management

Sub-contractor		Sub-contracted Work	Ref. to sub-contract
Company	Contact		
Microsoft Azure Databases	0800007128	Cloud Database infrastructure subscription	Server hosting of the cloud-based database for the farms. e.g. Inventory
Works well Thermal Imaging Systems	sales@workswell.eu	Thermal Imaging Camera	Thermal camera for night and day for cultivating
Global Mapper	orders@bluemarblegeo.com	3D mapping	Vectors and sectors to map around farm or test area

7. Communication and Reporting

Type of Communication	Method / Tool	Frequency /Schedule	Information	Participants / Responsible
Internal Communication:				
Project Meetings	Teams Meeting	Every Friday	Project status, problems, risks, changed requirements, solutions	Project Supervisor and Project Team
Sharing of project data	Microsoft One Drive server	When available	All project documentation, reports, and Research gathered	Project Supervisor and Project Team
Support Meetings	Discord Telecom Server	Every Tuesday	Send help requests and Assist those that need assistance	Project Team
Milestone Meetings	Teams Meeting	Before milestones	Project status Unexpected problems	Project Supervisor and Project Team and sub-contractor Team
Final Project Meeting	Teams Meeting	Milestone 9	Wrap-up Experiences Issues if available	Project Supervisor and Project Team and sub-contractor Team

Type of Communication	Method / Tool	Frequency /Schedule	Information	Participants / Responsible
External Communication and Reporting:				
Project Report	Word Document	Monthly	Project status - progress - forecast - risks	Project Manager Sub-Project Managers and
Stakeholders Meetings	Teams Meeting	Monthly	Give the latest update and receive constructive criticisms	Project Manager, Stakeholders

8. -Delivery Plan

8.1 Deliverables and Receivers

Ident.	Deliverable	Planned Date	Receiver
D1	Milestone 1 Project Plan	4 July 2022	Nsuku N. Ngoveni
D1	Milestone 1 Project plan	7 July 2022	Nsuku N. Ngoveni
D2	Milestone 2	13 July 2022	Nsuku N. Ngoveni
D3	Milestone 3 Business logic	16 July 2022	Nsuku N. Ngoveni
D4	Milestone 4 User interface	30 July 2022	Nsuku N. Ngoveni
D5	Milestone 5 Business logic creation	7 August 2022	Nsuku N. Ngoveni
D6	Milestone 6 Functional Requirements	16 August 2022	Nsuku N. Ngoveni
D6	Milestone 7 Functional requirements	9 September 2022	Nsuku N. Ngoveni
D6	Milestone 8 Functional req	16 September 2022	Nsuku N. Ngoveni
D7	Milestone 9 Presentation	7 November 2022	Nsuku N. Ngoveni
D8	Project completion	11 Nov 2022	Nsuku N. Ngoveni

9. Quality Assurance

The product's quality will be regularly improved by basic testing operations to discover technical faults in the code and analyze the overall product usability, performance, security, and compatibility.

By utilizing Agile testing, the development process is broken down into smaller pieces, iterations, and sprints. This enables work to be done in parallel with the rest of the team throughout the process, enabling defects and problems to be fixed as soon as they arise.

10. Configuration and Change Management

- **Description.** What will change in the product?
- **Why it must be done.** If you think about it, it may turn out that certain changes are not needed.
- **Who will be involved?**
- **Links to documentation**
- **Pre-installation. Reconciliation and Backup**
- **Install plan**
- **Post-installation.** Check that the system and all other systems interacting with it work correctly; return all the settings that were made in preparation for the change; make changes to the documentation.
- **Backout Plan.** Actions that will be performed in case of problems within a reasonable time.
- **Applications**

11. Security Aspects

<https://www.wrike.com/project-management-guide/faq/why-should-i-use-security-features-in-project-management-software/>

Physical security

- how often data is backed up
- power backup systems
- physical access controls

Network & system security

Application security

- User authentication
- Data sharing & role-based access control
- Monitoring user activities
- Project management software data encryption
- Mobile applications

Privacy

strict policies to limit access to customer data to employees

Compliance

- ISO/IEC 27001:2013 certification
- SOC2 Type II
- ISAE 3402

12. Abbreviations and Definitions

Help: List all abbreviations and definitions used within this document.

CCB	Change Control Board
CI	Configuration Item
CM	Configuration Management
COTS	Commercial Off the Shelf
CR	Change Request
CRM	Change Request Management
ID	Identification, Identifier
IP	Intellectual Property
QA	Quality Assurance
SteCo	Steering Committee
V&V	Verification and Validation
UAV	Unmanned aerial vehicle

13. References

<Doc. No.>	Project Proposal for <project name>
<Doc. No.>	Project Requirements Specification for <project name>
<Doc. No.>	Implementation Proposal for <project name>
<Doc. No.>	Project Schedule for <project name>
<Doc. No.>	Risk Management Plan for <project name>
<Doc. No.>	Work Breakdown Structure for <project name>
<Doc. No.>	Quality Assurance Plan (if it is a separate plan)
<Doc. No.>	Configuration Management Plan (if it is a separate plan)
<Doc. No.>	<Sub-contract #1>
<Doc. No.>	

14. Revision

Rev. Ind.	Page (P) Chap. (C)	Description	Date Dept./Init.
-	---	original version	
Elmar + Francois	Whole doc	1 st revision	12/08/2022