Annexure-I

Research

PROJECT PROPOSAL FOR FUNDING FROM VC'S INNOVATION FUND

1. **Title of the Project:** Virtual Reality integrated robotic car

2. **Name of Project Leader:**
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3. **Project Team:**
   Pallak Singh – 15CSU144
   Manik Kumar – 15CSU109
   Vinay Garg – 15CSU258
   Vineet Jain – 15CSU259

4. **Department:** Computer Science and Engineering

5. **Subject Area:** Virtual Reality, Internet of Things and iOS app development

6. **Objectives of the Project:**
   The main focus of this project is to create an economical system that combines a robotic car with integrated Virtual Reality so that such devices can be used widely in fields of research.
   This project leverages the mechanics of Virtual Reality to capture and transmit video in real time to a user at a distant location.
   1. Capture dual video feeds on car.
   2. Transmit the video to the receiver end.
   3. Display the video on the VR Headset.
   4. Provide a set of functionalities on the user end for the car, such as GPS tracking, speed control.

7. Introduction of the problem and state of the art:

There are a variety of applications that require quick and real time action-response in the world of robots. We require rapid information with the most meticulous observations from the robots sent in the remote areas we cannot reach ourselves. This project proposes a way to make the user controlling the robot to experience those remote areas like he were there himself. This project will utilize virtual reality for just this: an immersive and interactive experience.

In recent years, we have witnessed a growing amount of automated or man-less vehicles being sent into dangerous fields. Military and scientific exploration are the biggest users of the technology being developed in this area. Military sends in robotic vehicles into areas where it's not possible for humans to be present, be it areas infested with landmines or area under enemy control or often just casual patrolling reasons. Also, scientists often use a big amount of similar technology too, often to explore alien places, for example Chernobyl. Majority of this technology is proprietary and very limited when it comes to the video transmission aspect of it. What we're working on is to improve upon the video related aspects of the technology. The difference between what we proposed and the existing tech is that we'll be including a 360 Degree view from the vehicle, transmitted to us and viewed using a VR Headset (A Mobile Phone).

8. Justification of the project:

An accident at the Chernobyl Nuclear Power Plant rendered the entire area inhabitable for humans. A question here arises is that: given the increased radiation levels at the areas in question, how can the scientists conduct research that allows for meticulous observations without being there in person. Current systems for research in such type of remote or dangerous areas, are employing robotic vehicles that are only sending information, or are simply very limited in its video transmission aspect.

We propose to build a system that is not only providing a 360 view of the area but is also controllable using head movements for a more interactive experience. The goal here is to allow scientists to be as involved as possible in research in remote or dangerous areas.

Areas affected with radiation or areas with other inhabitable factors use monitoring systems for remote measurements at fixed locations. The

integration of these monitoring devices with a system that provides mobility and an immersive view of the field at hand can reduce the costs of installation of multiple of these systems as well as improve the task as a whole.
Virtual Reality focuses entirely on a more interactive and immersive experience. We want to leverage the mechanics of Virtual Reality to implement in fields outside entertainment, particularly research. The aim is to build an easily customisable system that can be tailored for the particular research at hand.

9. Expected Scientific Output/Intellectual Property Generation/Commercialization Possibility:

The system will generate the following output:

1. A robotic car transmitting video to VR headset (a mobile phone).
2. A mobile application for receiving the transmitted video and displaying it to the user. The video will fill the user's entire field of view.
3. The mobile application will send inbuilt sensor data(gyroscope, magnetometer, accelerometer) to the car so as to allow user to orient the car using his head (user turns his head right, car turns right).

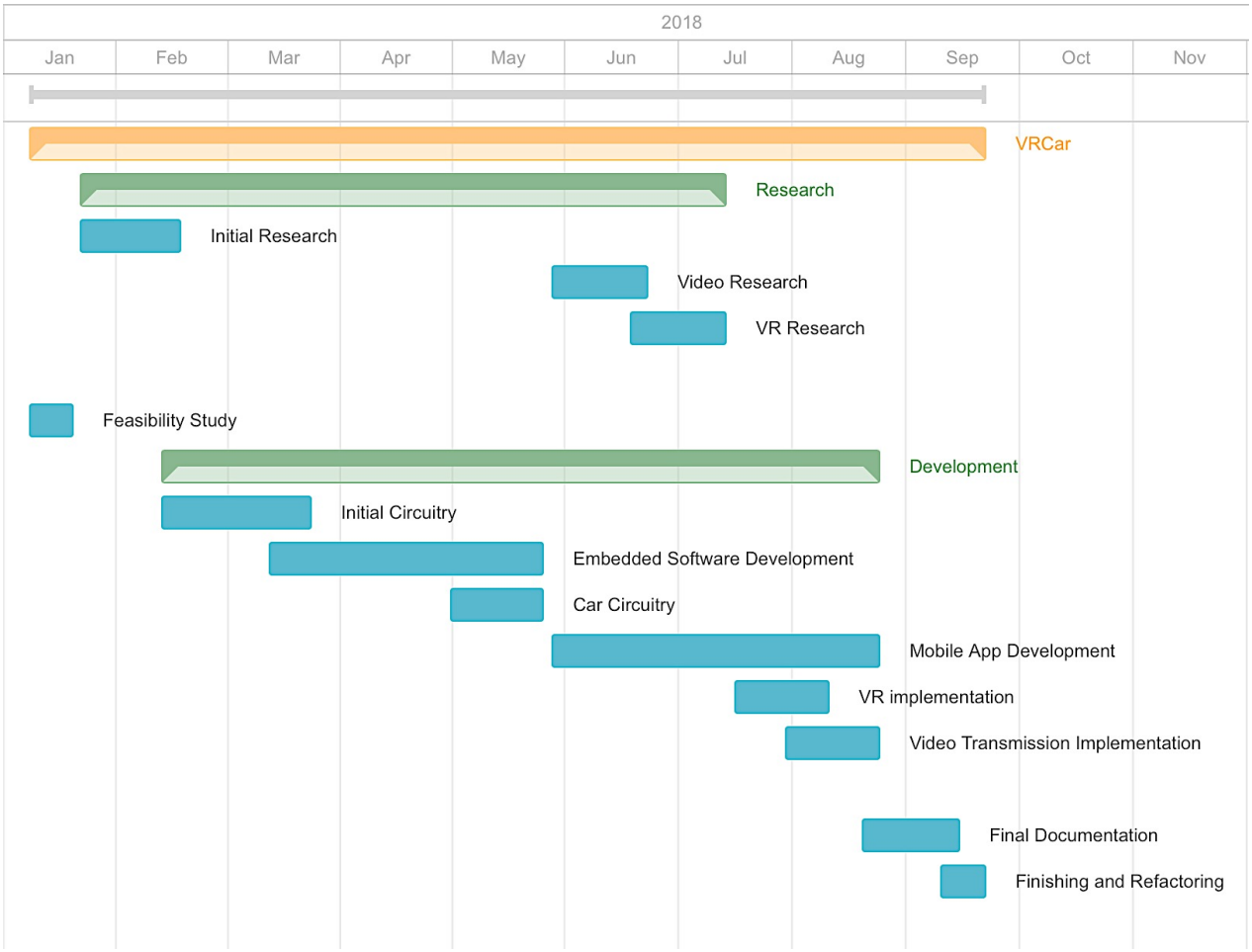
10. Methodology

We started the initial design process by conducting a research on embedded system designs for the car circuitry. After creating the basic design and prototype for the same, we moved towards the video transmission part of the project. We conducted the research and decided on HTTP live streaming as our protocol for the video transmission.
We plan on implementing the final circuitry and associated embedded software development for the same by May. Post the car hardware development, we will start the app development which will be an ongoing process as the VR and video transmission are integrated with it through the summer.

11. Work plan and activity

Milestone	Milestone Goal	Duration
Feasibility Study	Feasibility studies and basic system concepts have been approved by our mentor and further research into the project has started.	January
Requirement Review	Requirements details for the project are complete and further designing has started.	January - February
Design Review	Confirming that the design satisfies the project requirements and are capable to fully implement the system and are suitable for code input.	February - March
Coding and Development	Coding the actual software required and implementing the hardware.	March – August
Test Plan	Test Plans are Adequate for the testing of all product features, are approved and are suitable for input to the development of test cases.	July - August
Documentation and Testing	Preparing the final documentation for the model created. Software for the system has passed testing and is suitable for further input	August
Product Operational	The Software and Hardware are working the way they were indented too.	August - September

12. Gantt Chart



13. Existing Expertise and Facilities at NCU:

- Expertise of Dr. Jyotsna Singh
- 3D- Printer

14. Budget Requirements:

S. No	Description	1st Year	2nd Year	Total(Rs.)
	A. Capital			
1	Equipment	18,000		
	Total(A)			18,000
	B. Consumable			
1	Raw materials, Consumables.	4,000		4,000
2	Manpower	0		
3	Testing Charges	500	500	1,000
4	Contingency & Others (Repair & Maintenance)	2,000	1,000	3,000
	Total(B)			8,000
	Total(A+B)			26,000

List of New Equipments/Software and New Common Facility

Sr. No.	Capital Equipment/Software	Total (Rs.)
1.	Arduino Nano	400
2.	Odroid XU4	6,000
3.	Camera(x2)	8,000
4.	Circuitry Accessories	3,000
5.	3D – Printer Material Cost	4,000
Total		21,400

15. Extra Manpower required, if any:

No

16. Details of Collaboration, if any:

No