ECE4011/ECE 4012 Project Summary

Project Title	Long-Range UAV RFID Reader for Use with RFID Cattle Tags
Team Members (names and majors)	Jesse Baker (EE) Neil Dahlqvist (EE) Ashley Hrebik (CmpE) Santiago Juarez (EE) George Tzintzarov (EE)
Advisor / Section	Manos Tentzeris (A05/A06)
Semester	2016/Fall Circle: Intermediate (ECE 4011) **Final (ECE 4012)**
Project Abstract (250-300 words)	The purpose of this project is to design, build, and test a Radio-Frequency Identification (RFID) system for use in the cattle industry, which tracks various cattle and recognizes if a cow is lost. The project is focused on improving the read range and reading capabilities of the RFID technology through a system level optimized design. A system of this caliber will reduce the day to day labor of counting cattle in various herds from a multi-hour procedure down to only one hour. In order to meet these specifications, the transmitter/receiver components of a typical RFID system will be researched, redesigned, and optimized. Higher frequencies will be used due to the fact that they are known to increase the read range of the system and allow multiple tags to be read at once. RFID systems with longer read ranges also require more sophisticated power management solutions, so a secondary effort will go into designing the platform on which this system will be built. This project will seek to investigate the design of a mobile reader mounted on an unmanned aerial vehicle (UAV) for inventory and field rotation of cattle with possible location capabilities. The development of readers with these capabilities will depend on (1) frequency of operation, (2) antenna structure and size, and (3) power management. The expected outcome of the design is a fully functional prototype that will cost $3,000.

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List **codes** and **standards** that significantly affect your project. Briefly describe how they influenced your design.	- ISO 11784: The international standard defining frequencies, baud rate, bit coding and data structures of transponders used for animal identification. - Class 2/Class 3 RFID tag standards (for semi-passive tags) - Data content codes for 64-bit identification code (15 digit numeric) - Air interface protocol
List at least two significant **realistic design constraints** that applied to your project. Briefly describe how they affected your design.	- RFID tags must be non-active to meet specifications for weight and longevity, making performance of the RFID reader essential - RFID tag can only store small data size - RFID reader is either portable, fixed, or portable-fixed (fixed reader on a mobile station) imposes different constraints concerning battery life and range
Briefly explain two **significant trade-offs** considered in your design, including options considered and the solution chosen.	- Having the option to place an applicable reader on an ATV will allow for a larger battery to be used, therefore allowing for a larger reading range. Otherwise handheld reading will be used and a smaller battery will be needed, which will cause the read range to be smaller - Active tags weigh more and could warp the cattle's ear, but obtain a much longer read range than the smaller, passive tags
Briefly describe the **computing aspects** of your projects, specifically identifying **hardware-software** tradeoffs, interfaces, and/or interactions. *Complete if applicable; required if team includes CmpE majors.*	- RFID reader must be able to encode RFID tags - Software that communicates with RFID reader to process and maintain data for animal logs - Software that updates in real-time the location and information of cattle - Location device/algorithm (possibly a laser) that can pick out one specific cow from a herd

ECE4011/ECE 4012: International Program

(Only groups with one or more International Program participants need to complete this page)

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Global Issues (Less than one page)	N/A