UNC CHARLOTTE
The WILLIAM STATES LEE COLLEGE *of* ENGINEERING

UNC Charlotte – Lee College of Engineering Senior Design Program
Company Information

Company Name	Electrical and Computer Eng.	**Date Submitted**	10/19/2019
Project Title	LEGO Sorting Robot **(UNCC_LEGO)**	**Planned Starting Semester**	Spring 2020

Funding:

What is the source of funds that will be used to cover all of the direct costs of this project?
NC Space Grant, 530312

Is this source of funds already secured? Yes ___x____ No _____

Technical Contact(s)*

	Technical Contact 1	**Technical Contact 2**	**Technical Contact 3**
Name	James Conrad		
Phone Number	704-687-8597		
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*We would like to have more than one technical contact, so there is a back-up in case of travel, sickness, job re-assignment, etc.

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

Discipline	**Number**	**Discipline**	**Number**
Mechanical	2	Electrical	1
Computer	2	Systems	0
Other ( )			

Note: More students can be added (up to a total of 7 on the team) if you need some place to put students, but the numbers above are needed at a minimum.

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Project Overview and Requirements:

The Department of Electrical and Computer Engineering runs many workshops where children build robots using the LEGO MindStorms EV3 Educational kit. When the children have completed building and programming their robots, they are instructed to disassemble their robots and put the parts in the correct bins of their kit bucket. Unfortunately, they are not very effective at putting the parts in correct places. Also, sometimes they lose parts on the floor, or borrow parts from other kits, such that the correct number of parts are not in the "sorted" kits.

What is needed is a robotic device that can:

- Identify parts lying on a flat surface
- Determine the appropriate parts that need to be put in a tray (and the missing or extra parts)
- Pick up the parts and place them in specific bins of a tray
- Generate a report on the extra parts and missing parts
- Perform this operation in 10 minutes or less
- Perform this sorting task with 98% accuracy (start to end: that means 98% of the parts are in the correct bins in the correct number).

Although a LEGO MindStorms kit has over 200 parts, this project will only concentrate on the simple plastic parts which come in top tray of the kits. The identification, pick, and place operations do not need to be performed on the programming brick, motors, sensors, or cables.

Figure 1: a) The entire kit b) The sub-part of the kit which needs to be sorted

Expected Deliverables/Results:

Deliverables include:

- a working robotic device
- full design details, code listings, drawing, sources of materials
- instruction manual

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

Depending on your discipline, you should have knowledge of one or more of the following concepts:

- Image processing/object identification
- Linux
- OpenCV
- Programming
- Motor control
- Mechanical structures
- Robotics (mechanical, electrical, and/or computer subsystems)