**ECD Project Specification Document**

***<ECD423> <Novel Midi Instrument>***

**Project Description**

**Summary:**The premise of this project is to design a creative and unique MIDI interface that is able to imitate a variety of musical instruments. The MIDI device must be able to have polyphony, demonstrate variable volume control and be capable of pitch bend. Due to the obscurity of this project, a major portion of the time spent on this proposal will be spent brainstorming potential ideas. Continuous experimentation and trials will take place throughout the entire design process to guarantee the optimal usability of each component in this project.

**Sponsor:** N/A

**Industry Mentor (if applicable):** N/A

**Project Advisor:** Professor Scott Craver

**Team:** Sean MacHaffie, Baron Li, Rohan Giridharan, Jolin Lin

**Requirements**

This document lists all essential project requirements for this project. A requirement is identified by “shall”, a good practice by “should”, permission by “may” or “can”, expected outcome or action by “will”, and descriptive material by “is” or “are” (or another verb form of “to be”).

The following Qualification Method (QM) is to be used:

* Demonstration (D): The operation of the system, or a part of the system, that relies on observable functional operation not requiring the use of instrumentation, special test equipment, or subsequent analysis.
* Test (T): The operation of the system, or a part of the system, that uses instrumentation or other special test equipment to collect data for analysis.
* Analysis (A): The processing of data obtained from another qualification method. For example, reduction, interpolation, or extrapolation of test results.
* Inspection (I): The visual examination of system components, documentation, etc.

The following Requirement Categories (RC) are to be used:

* System Capability Requirements (SC): Requirements pertaining to the functionality and behavior of the system.
* System External Interface Requirements (EI): Requirements based on the external interfaces of the system. Interfaces with input power, user input, or any other outside source
* Project Business Requirements (PB): Requirements pertaining to business objectives set by a sponsor such as installation requirements, requirements pertaining to specific lab access or lab equipment needs etc.
* Other Requirements (O): Safety, Security and Privacy, System Environment concerns etc.

**2.1 Derived Requirement Specification**

| ID | QM | RC | Derived Requirement |
| --- | --- | --- | --- |
| ECD423-R-001 | D | SC | The MIDI instrument shall be able to produce polyphony. |
| ECD423-R-002 | D | SC | The MIDI instrument shall be able to produce pitch bend. |
| ECD423-R-003 | D | SC | The MIDI instrument shall be able to produce variable volume control. |
| ECD423-R-004 | I | O | It shall output accurate MIDI signals to a synthesizer. |
| ECD423-R-005 | I | SC | The device shall not inhibit the functions of an ordinary microphone stand. |
| ECD423-R-006 | D | SC | Both keypads will be capable of rotation and sliding movement on the rod. |
| ECD423-R-007 | D | SC | The device shall be able to switch between at least 6 different instruments based on keypad rotation, keypad location on rod, and rod tilting motion. |
| ECD423-R-008 | I | SC | There shall be wireless communication between the keypads and base station. |
| ECD423-R-009 | A | SC | The device shall be able to detect the position of both keypads on the rod at any given time. |
| ECD423-R-010 | I | SC | The base station shall have the capability to differentiate between 3 positions on the rod: horizontal, vertical, and angled. |
| ECD423-R-011 | T | EI | MIDI signals shall travel from the base station to a synthesizer via USB connection. |

**2.2 Derived Stretch Goals**

| ID | QM | RC | Stretch Goals |
| --- | --- | --- | --- |
| ECD423-G-001 | T | O | The response time between note pressing and note emission from the synthesizer should be less than 10ms. |
| ECD423-G-002 | I | EI | The instrument should be able to synthesize sound directly from the product. |
| ECD423-G-003 | I | SC | Both keypads should have an electronic locking/unlocking mechanism to secure its position on the rod when locked and allow for movement when unlocked. |
| ECD423-G-004 | D | SC | The device should be able to switch between at least 10 different instruments based on keypad rotation, keypad location on rod, and rod tilting motion. |
| ECD423-G-005 | I | SC | The device should have 4 lamellophone style keys which are attached to force sensors and produce sound reminiscent of strumming string instruments. |

**2.3 Original Proposed Requirements**

| QM | RC | Original Requirements |
| --- | --- | --- |
| D | SC | The MIDI instrument shall be able to produce polyphony. |
| D | SC | The MIDI instrument shall be able to produce pitch bend. |
| D | SC | The MIDI instrument shall be able to produce variable volume control. |
| I | EI | It shall output accurate MIDI signals to a synthesizer. |