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| **Assignment 1** | | Project Summary | |
| **Course** | | Practical Robotics and Smart Things - 2020 | |
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| **Project author** | | | |
| № | Pseudonym | | In person/online |
| 1 | Instructor | | face-to-face |

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| Project name | Cine-Bot (CB-A1) |

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| 1. **Short project description (Business needs and system features)** |
| Cine-Bot α (CB-A1 for short) is a small camera controlling robot intended to be used for scale stop-motion animation/movie making.  CB-A1 aims to utilize the newest technologies in the IoT & robotics world.  CB-A1 is comprised of 2 parts, the robotic cine arm (RCA) and motion capture controller (MCC). Although the RCA itself will have a screen, the MCC is used to interface with the RCA remotely via a wireless connection. Via the MCC the operator can control every aspect of the RCA from the camera to motion programming. In the following section both components are discussed in more detail.  The hardware implementation as mentioned before is divided into two parts:   1. The RCA 2. The MCC   **The RCA**  The RCA is based on the Raspberry PI 4 4GB.  *Sensors:*   * Accelerometer – used for camera and arm control. * Gyroscope – Used for camera tilt/rotate movement. * Ultrasonic distance sensors – used for 360 collision detection during full manual mode (mode described later in the “Modes” section. * Light sensor – used for operator feedback & automatic lighting adjustment.   *Image/Video capture & lighting:*   * Raspberry Pi Camera v2 – uses as primary image/video capture device. * LED Array for scene lighting – used as a backup light source for the camera   *User controls:*   * LCD Touch screen - for user interaction * Buttons - for motor jogging mode (testing motors directly from the robot) * On/Off button   *Actuators:*   * *Servo/stepper motors – used as primary control devices.*   **The MCC**  The MCC is also based on the Raspberry PI 4 4GB.  *Sensors:*   * Accelerometer – used to capture user motion in the X, Y, Z axes. * Gyroscope – used to capture user rotation motion (tilt/pan)   *User controls:*   * LCD Touch screen - for user interaction * On/Off button * Servo for collision warning system – provides feedback to the user weather or not the RCA is about to hit an object.   **Modes of operation**   1. Full manual – control comes directly from MCC. 2. Manual Stabilized – control comes from the MCC but is filtered to remove shaking from the operator. 3. Learn & repeat – control comes from MCC once and then the path is remembered and can be executed again. 4. Tracking semi-auto – can lock onto object but is controlled by MCC. 5. Tracking auto – tracks object without ability for MCC control. 6. FrameX (auto after initial programming) – stop-motion mode. Follows path divided into frames, ideal for making a stop-motion sequence.   **User interaction**  The main way the user will interact with the system is either through the GUI directly on the RCA or through the MCC GUI.  **Communication Between Modules**  (Currently being researched but it will likely be via UDP or Ad-hoc Wi-Fi  There is also a mobile web application coupled with REST/JSON API allowing the users to connect with the cocktail machine, see its working status, and the levels of available beverages in real-time, re-train the system by providing new pictures, specify/change his/her favourite cocktail, or schedule cocktail preparation for later time. The ICM uses *Server Sent Events (SSE)/WebSocket* server push alerts to warn the administrative user when the level of some beverage supply becomes critical.  The main user roles (actors in UML) are:   * *Unregistered User* – can only view the information pages, and register either by using: 1) automatic learning mode activation or 2) by sending his/her pictures and cocktail preferences taken using the mobile application; * *Registered User* – can make cocktails, track the alcohol drunk during the evening, schedule/cancel cocktails preparation, and check the cocktail preparation status in real time using mobile app, the user can also change his/her pictures in order to re-train the machine learning algorithm; * *Administrator* (extends *Registered User*) – can manage (create, edit user data and delete) all *Registered Users*, as well as all their data, receives real-timeICM status information and alerts when the beverage supply level becomes critical, receives analytics in the form of mobile application dashboard, allowing to plan the need for different beverage supply quantities. |

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| 1. Main Use Cases / Scenarios | | |
| **Use case name** | **Brief Descriptions** | **Actors Involved** |
| * 1. **Select Mode** | The *User* can browse the different modes that are available and select one. | All users |
| * 1. **Start Execution** | *The user can start the execution if the full auto mode is enabled* | *All users* |
| * 1. **Jog Mode** | *The user can test if all of the motors are functional by pressing the buttons on the machine.* | *All users* |