**Release Notes**

**For**

**Wearable RFID Interaction Tracking System**

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**Cycle:** III

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# **Final Delivery**

The following deliverables will be included in the final delivery of the Wearable RFID Interactions Tracking System:

1. Wearable RFID Interaction Tracking System source code
2. Wearable RFID Interaction Tracking System hardware components
   1. RFID Tags (9)
   2. RFID Reader Nodes (7)
   3. PC Reader (1)
3. Wearable RFID Interaction Tracking System user documentation
   1. General User Manual Documentation
   2. Administrative Setup Documentation
4. Release Notes
5. Software Requirements Specification
6. Software Design Specification

# **Software Requirements**

## Software Requirements Implemented

In looking at the Wearable RFID Interaction Tracking system today, all software requirements set forth by Gabriela Marcu have been integrated into the system. All the detailed requirements currently implemented can be found in Appendix A.

## Software Requirements Changed

Based on the progress made to today’s date, a number of software requirements have been updated. All updated requirements can be seen in Appendix A.

As was changed per the set of release notes from the previous Senior Design cycle, the requirement 6. Extrapolate Tag Location was updated. Before making the necessary changes, that set forth requirement entailed the system extrapolating the location of each tag based on a dynamic grid, subject to data entry from the Data Analyst. The analyst would have entered the dimensions of an environment area with enabled reader nodes in the system, and in turn the system would have created the grib with the supplied dimensions for plotting and returning the locations of the tags. Since visualization of the reported results is no longer a requirement, a dynamic grid is unnecessary, and the system now calculates tag locations by gathering the strongest signal values from nearby reader nodes. The absence of a dynamic grid further resulted in changing sub-requirement 1. of sub-requirement A. of 3. Store Data, sub-requirement D. of 13. Displaying Data, and sub-requirements E. and F. of 5. Determine Distance.

# **Known Issues**

The table below shows all known issues with the Wearable RFID Interaction Tracking System, but these issues are not system-critical:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Issue ID#** | **Issue Title** | **Issue Description** | **Date Opened** | **Assignee** |
| 4 | Consistent Button UI | Currently the buttons in the initial view do not have the same theme as the rest of the buttons throughout the interface. | 5/30/2015 | Ken Hodel |
| 6 | Start End Time Checking | The current interface allows for start times to be chosen after end times and end times to be chosen before start times when choosing criteria to search the database with. This does not break the interface however it yields no results in the results view page. | 5/31/2015 | Ken Hodel |
| 8 | Inaccurate Pings from Reader Node | Occasionally a reader node will not forward a ping which will cause a tag to appear closer to another reader node. The issue never occurs twice in a row. Severity is medium as it can reduce the accuracy of the system but not critical as the error never occurs twice in a row.  Severity has been reduced to low by increasing the delay between tag pings. Frequency at which readers fail to forward a ping has been greatly reduced however the problem still occurs infrequently. | 6/1/2015 | Mit Dalsania |

# **Appendix A - Features Implemented**

The requirements below have been implemented into the system as of right now:

* + 1. **Assign Tag ID Number**
       1. Each tag within the system will have a uniquely identifiable number starting with 1 and continuing to Nth number.
    2. **Identify User**
       1. Each user in the system will be identified by a single tag within the system.
    3. **Store Data**
       1. The system will store the data received from the PC reader3 into a data table.
          1. The first data table referenced in *Sub-Function 3.3.3.1* will contain only data related to location and the tag ID. (Tag ID, Reader Node ID Map ID, and Time)
       2. Data linking a user’s name to a tag ID will be contained in a separate data table.
          1. The second data table will contain user specific information. (Tag ID, Name, Role within the organization)
       3. The system will store data related information to tags, readers, and maps in separate tables
          1. The third data table will contain data related directly to the tags themselves. (Tag ID, MAC Address)
          2. The fourth data table will contain data specific to the reader’s locations within the floorplan/map. (ID, Map ID, Mac Address, Name of Location, X Coordinate, and Y Coordinate)
          3. The fifth table will contain the data related to the floorplan/map (ID, Name, X Coordinate, Y Coordinate)
    4. **Export Data**
       1. The system will be able to export the data the analyst selects to a file usable in a spreadsheet application
    5. **Determine Distance**
       1. The system will collect values of tag signal strength with respect to the reader nodes.
       2. From the signal strength, location will be determined.
       3. Location will be determined by getting the reader node with the strongest signal strength.
       4. The reader node with the strongest signal strength will be set as the location of the location tag.
       5. The location of the reader node will be set by X, Y distance in pixels.
       6. A distance value (in X, Y) will be determined based upon a scale of pixels to units of distance. See *Sub-Function 3.3.10.4* for units of signal strength.
    6. **Extrapolate Tag Location**
       1. The system will extrapolate the location of each tag on the designated floor.
       2. Location will be calculated by gathering the strongest signal values from nearby reader nodes.
       3. The location of the tag will be set to the location of the reader node with the strongest signal value.
       4. Each signal values will come from a different reader node3. (I.E. each distance value will be tied to a different reader node ID)
    7. **Extrapolate Duration**
       1. The system will provide data for user to extrapolate duration of interactions with other tags.
    8. **Communicating between the Tag and the Reader Node**
       1. The tags within the system will send out calls to the reader nodes at designated intervals.
       2. The system will put the tags into an idle state between the designated intervals stated in *Sub-Function 3.3.9.1*.
    9. **Collecting Data from the Tag**
       1. The reader nodes will receive data calls from the tags.
       2. The reader nodes will continuously listen for data calls from tags.
       3. The reader nodes will capture the tag ID from the data call.
       4. The reader nodes will capture signal strength from the data call.
          1. The signal strength will be on a scale from 0-98.

A signal strength of 0 is the strongest.

A signal strength of 98 is the weakest.

* + - 1. The reader nodes will not store any data.
    1. **Transfer Reader Node4 Data**
       1. The reader nodes will forward the tag ID to the PC reader4.
       2. The reader nodes will forward the reader node ID to the PC reader.
       3. The reader nodes will forward the received signal strength of the tag data call to the PC reader.
       4. The reader nodes will forward the time of the received data call to the PC reader.
    2. **Handling PC Reader Data**
       1. The PC Reader will receive data sent from the reader nodes.
       2. The PC Reader will send the received data referenced in 3.3.11 to the PC.
       3. The PC will store the data received from the PC reader in a database.
    3. **Communicating via RFID Signals**
       1. The hardware will communicate via active RFID signals.
          1. The tags will communicate via the 915 MHz band5.
          2. The reader nodes will communicate via the 915 MHz band.
          3. The PC reader will communicate via the 915 MHz band.
    4. **Displaying Data**
       1. The system will allow the analyst to select criteria they want displayed.
          1. The criteria will consist of Tag Number or Time/Date.
          2. The system will allow separate start and end Time/Dates
       2. Once the analyst selects the desired criteria, the results will be displayed in tabular form.
       3. The data tables will be displayed in a web interface that allows the analyst to navigate back and specify new requirements.
       4. A plot of the tag locations will be generated in a separate web interface as a result of area dimensions (in feet) input from the Data Analyst
    5. **Non-Functional Requirements**
       1. The system will only track tags.
       2. The tags will have their own self contained replaceable power source.
       3. The reader nodes will be powered by an external power supply.
       4. The PC reader will be powered via an external power supply.
       5. The PC reader will send data to the PC via an emulated serial connection.
       6. The criteria determining a face to face interaction will be determined by the Data Analyst.

# **Appendix B** - **System Development Progress**

From the perspective of the below project plan submitted at the beginning of the current Senior Design sequence, all tasks to date have been completed. Each team member has actively worked towards the completion of the tasks assigned to them with respect to the anticipated start and end dates. There was little if any wavering from those start and end dates. All materials required by the system’s stakeholder, Gabriela Marcu, and the Senior Design instructor, Filippos I Vokolos, will be submitted by the end of the week of 5/31/2015.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Task** | **Duration (Weeks)** | **Team Member** | **Start Date - End Date** | **Status** |
| Meet with stakeholder to determine customer and software requirements | 2 | Ken Hodel, Mit Dalsania, Myles Adam, Anthony J. Popolo | 10/6/2014 - 10/20/2014 | Completed |
| Meet with potential study subjects and explore study area (Autism Institute) | 2 | Ken Hodel, Mit Dalsania, Myles Adam, Anthony J. Popolo | 10/31/2014 - 11/14/2014 | Completed |
| Acquire hardware | ~2 | Ken Hodel, Mit Dalsania | 1/15/2015 - 1/29/2015 | Completed |
| Development of Software Design Specification | 3 | Ken Hodel, Mit Dalsania, Myles Adams, Anthony J. Popolo | 1/19/2015 - 2/9/15 | Completed |
| Setup test environment with hardware  (Steps 1-3 below) | ~3 | Ken Hodel, Mit Dalsania, Myles Adams, Anthony J. Popolo | 1/30/2015 - 2/20/2015 | Completed |
| *1. Build the Components* | (1) | Ken Hodel, Mit Dalsania, Anthony J. Popolo | 1/30/2015 - 2/6/2015 | Completed |
| *2. Flash the Firmware* | (~1) | Ken Hodel, Mit Dalsania | 2/6/2015 - 2/13/2015 | Completed |
| *3. Test the Components* | (~1) | Ken Hodel, Mit Dalsania, Myles Adams, Anthony J. Popolo | 2/13/2015 - 2/20/2015 | Completed |
| Software Development  (Steps 1-3 below) | ~4 | Ken Hodel, Mit Dalsania, Myles Adams, Anthony J. Popolo | 2/9/2015 - 5/10/2015 | Completed |
| *1. Database and Data Collection Development* | (~2) | Ken Hodel, Mit Dalsania | 2/9/2015 - 2/20/2015 | Completed |
| *2. Data Analysis Web Interface Development* | (1) | Ken Hodel, Myles Adam, Anthony J. Popolo | 2/20/2015 - 5/10/2015 | Completed |
| *3. Integration Testing* | (1) | Ken Hodel, Mit Dalsania, Myles Adams, Anthony J. Popolo | 5/4/2015 - 5/10/2015 | Completed |
| Develop System Test Plan | (~2) | Ken Hodel, Mit Dalsania, Myles Adams, Anthony J. Popolo | 4/13/2015 - 4/27/2015 | Completed |
| Implement system on 5th floor of 3020 Market Street, the A.J. Drexel Autism Institute, Suite 560 | (~1) | Ken Hodel, Mit Dalsania, Myles Adams, Anthony J. Popolo | 5/11/2015 - 5/18/2015 | Completed |
| System Testing | (~2) | Ken Hodel, Mit Dalsania, Myles Adams, Anthony J. Popolo | 5/11/2015 - 5/22/2015 | Completed |
| Write Documentation for Stakeholder (split up into software documentation, hardware documentation) | (~2) | Ken Hodel, Mit Dalsania, Myles Adams, Anthony J. Popolo | 5/14/2015 - 5/22/2015 | Completed |

*Figure 1: Project Plan*