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Augmented Reality Tractor Information Management Utility System

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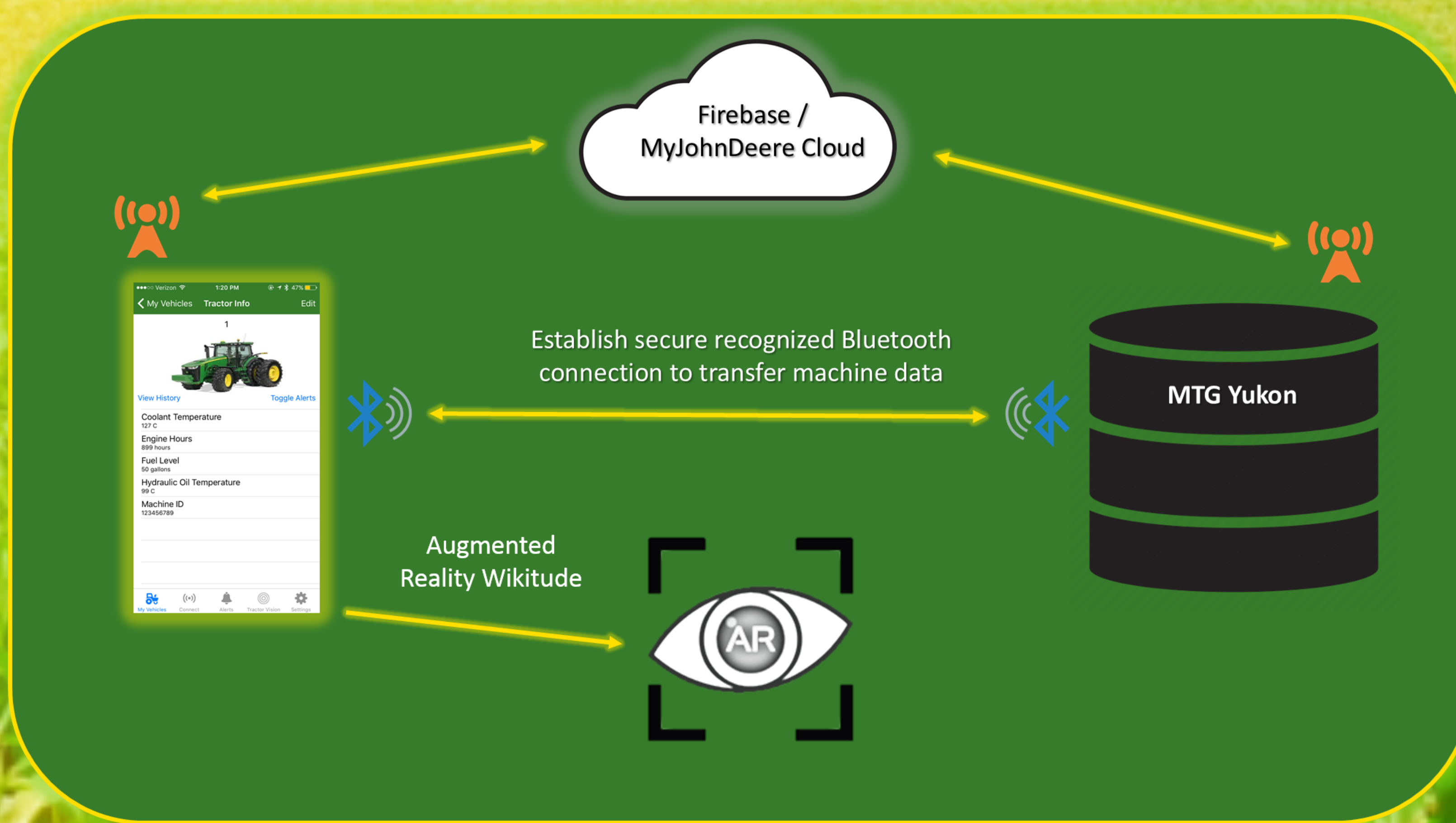
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Problem and Solution

Currently John Deere tractors have the capability to send their own vehicle health information to their MyJohnDeere account which can be accessed on the web. This process is achieved largely due to the onboard device on the tractors called the Modular Telematics Gateway, or MTG. The MTG performs as a server that collects data from the tractor such as: hydraulic oil temp, fuel level, machine hours, tire pressure, and others as well. The problem that arises from this implementation is that the MTG cannot send its data if there is no cellular connection available, this is where our project fills the gap.

Our iPhone application communicates to the MTG via Bluetooth to request all of its data from the tractor. From there our easy to use interface allows the user to easily navigate through all of their tractors and view the alerts for each tractor if they are in the field with no cellular signal. In addition to this, our mobile application also offers some new and cutting edge augmented reality software that allows the user to simply point and scan their tractor, which then displays visual alerts on the screen.

Components

Tech Details

Hardware
- MTG
- iPhone
- Farm Equipment

Software
- xCode
- Wikitude
- FireBase

Cloud Storage

FireBase
- User Validation
- Push machine alert data
- Pull historical machine alert data
- Removes need of user's local phone storage

Bluetooth
- MTG acts as peripheral with configured GATT profile
- iPhone scans for Bluetooth devices that match the UUID for the MTGs
- iPhone gets characteristics from MTG service and translates data into alerts

Augmented Reality

Wikitude
- Augmented reality image recognition
- Uses iPhone camera to scan and recognize John Deere equipment
- Overlays augmented alerts on vehicles

Design

Among the target audience (John Deere tractor owners) about 53% were using the iOS platform. Our application was designed to run on iOS 9 and up and was tested on iPhone 5. We followed John Deere mobile app styling guide when making the screen flows.

Functional Requirements

- Operate in 3 modes: Farmer, Dealer, Developer
- Connect directly to MTG via Bluetooth
- Create alerts for multiple vehicles based on John Deere's maintenance thresholds
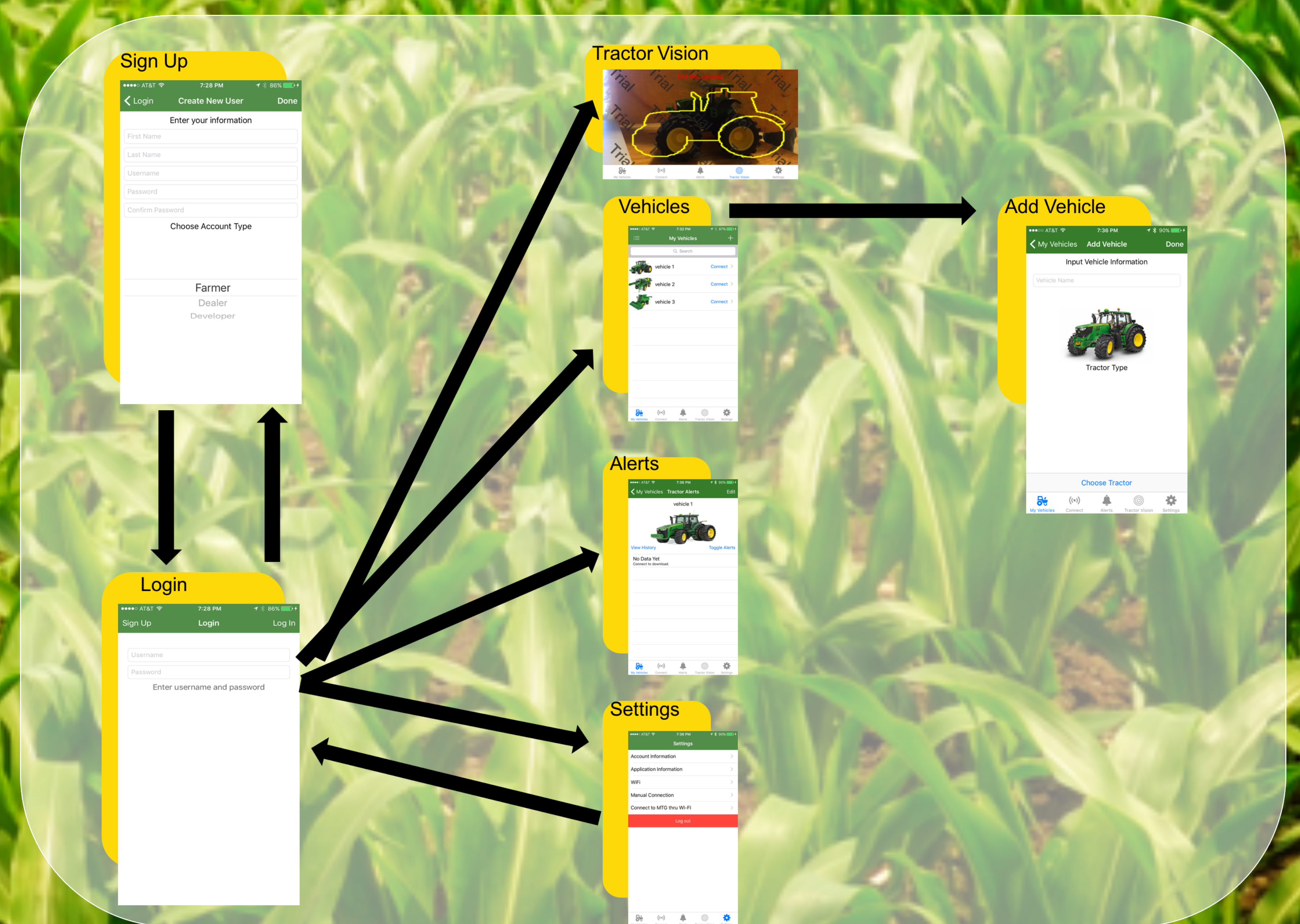- Display user friendly augmented reality scene that shows real time machine alerts

Non-Functional Requirements

- User interface abides to John Deere Style guide
- Run on newer versions of iOS
- Keep user's data separate from other users

Operating Environment

Intended Users
- **Farmers** – Use the app to view data, alerts, and augmented reality
- **Dealers** – all of the farmer mode features and in addition allow dealer to quickly sort, classify, tag and search for vehicles registered
- **Developers** – all of the features from farmer and dealer modes and in addition view and download log files

Testing

Database Testing
- When a user account is created check the database
- When a user adds a new vehicle check the database
- When a user is logged out make sure the session variable is false
- When an alert happens on a vehicle make sure the alert is stored

Augmented Reality Testing
- Test on large farm equipment for consistent recognition
- Test camera angles, object backgrounds, and other models of equipment
- Test overlaying of alert data to correct equipment parts
- Use Wikitude on iOS devices to test for hardware constraints (battery life, camera, etc.)

MTG Testing
- Parse received data correctly
- Make sure Bluetooth connection has correct name when paired
- Includes correct VIN and model number
- Make sure MTG is relaying all of the data points to the mobile device