Smart agriculture using iot projects pdf

The agricultural and agricultural industries rely on innovative ideas and technological advances to help increase yields and better allocate resources. The late 19th and 20th centuries produced a number of mechanical innovations, such as tractors and harvesters. Today, a driving force behind increased agricultural production at a lower cost internet of things (IoT), which leaves the door wide open for engineers who want to get a smart agricultural solution or IoT agricultural sensor on the market. Internet of Things applications in agriculture include tracking vehicles in agriculture, monitoring livestock, monitoring of storage and much more. For example: Cattle sensors can notify ranchers when animals have wandered from the herd so that ranch hands can round them. Soil sensors can warn farmers of irregular conditions such as high acidity, giving the farmer time to reconcile the problem and produce better crops. Self-driving tractors can be remotely controlled, resulting in significant savings in labour costs. In the coming years, the use of these and other smart agricultural technologies will increase. In fact, IoT unit installations in the agricultural world are projected to experience a compound annual growth rate of 20 percent. And according to a Machina research report from January 2016, the number of connected agricultural products is expected to increase from 13 million by the end of 2014 to 225 million in 2024. Looking for an overview of how to implement the technology you need for your smart agricultural solution? Below we have outlined three generic IoT agricultural use cases and seven IoT agricultural applications already on the market that allow farmers and ranchers to gather meaningful data. In addition, we'll walk you through five technical issues that you should consider before completing your smart agricultural solution. IoT In Agriculture-Use Cases Livestock Monitoring Thanks to livestock monitoring, ranchers can use wireless IoT programs to collect data regarding the health, welfare, and location of their cattle. This information saves them money in two ways: It helps to identify sick animals so that they can be pulled from the animal, preventing the spread of disease. It lowers labor costs because ranchers can identify where their livestock are located. There are some specific challenges when instrumenting livestock with sensors. Specifically, it is quite difficult to equip livestock with a collar. An alternative option is to use a wireless post-mounted bolus in the cow's stomach, which can communicate via Bluetooth to an eartag. Another potential challenge ranchers face in implementing an IoT solution is choosing a wireless technology with enough battery to keep the life of the animal. A beef cow, for example, lives 15 months or longer—and while some technicians using a network network are unlikely to handle that kind of battery life, Symphony Link can easily connect for that time without infrastructure around the ranch ranch connect all the devices. Conservation Monitoring Although it does not strictly fall under the heading of agriculture, monitoring for endangered rhinos is one of the more interesting animal IoT use cases out there. Knowing where rhinos are in large gaming facilities can help conservationists protect them from poachers. As one might imagine, collaring a rhino is not easy—and we've found it not often successful. The collars are being ripped off during the fighting, and they have been known to cause behavioural changes in the rhinos. To overcome these obstacles, we are currently exploring the idea of putting Symphony Link devices in a rhino's horn. Plant & Soil Monitoring For Precision Farming Monitoring plant and soil conditions is a simple use case—but it can lead to a fantastic return on investment for farmers. We have seen several good uses for farming IoT in this space: Sensing for soil moisture and nutrients. Control water use for optimal plant growth. Determine custom manure profiles based on soil chemistry. Determine the optimal time to plant and harvest. Reporting weather conditions. Since the sensors in all use cases above are near the ground, using a network network can be difficult. There simply isn't enough link budget. But star topologies like Symphony Link are an ideal fit, as an access point can talk to a number of sensors 20-100 square kilometers away. Although these generic case studies provide insight into how IoT in agriculture can be useful to the agricultural community, it is also important to understand what IoT agricultural projects and applications have already developed: 7 Interesting IoT Agriculture Projects & Applications 1. Cropx's Soil Monitoring System Cropx produces hardware and software systems that measure moisture, temperature and electrical conductivity in the ground. Their system tells farmers when and how much to irrigate. 2. TempuTech's Wireless Sensor Monitoring TempuTech saw a need for increased safety in agricultural storage. Silos and grain lifts can be dangerous places, with conveyor belts that can catch fire and dust buildup that can be explosive. Using sensors to track hazards is of massive value. With GE's Equipment Insight, TempuTech created a way to connect wireless sensors and help farmers understand data from their silos and grain elevators. This platform enables manufacturers to set baseline performance standards and set warning and alarm conditions related to temperature, vibration, humidity, and other conditions. 3. CLAAS's Smart Equipment CLAAS is one of the world's leading manufacturers of agricultural engineering equipment. Farmers can use CLAAS equipment on autopilot, get advice on how to improve crop flow and minimize grain losses, or automatically optimize equipment performance. The company collaborates with 365FarmNet, a program that makes it for farmers to manage their entire agricultural holdings on a computer or mobile device. System System data and make meaningful use of it through field mapping, fertilization planning, nutrient balance and calendar and planning programs. 4. PrecisionHawks Drone Data Platform PrecisionHawk has created an autonomous UAV that collects high-quality data through a series of sensors used for surveying, mapping and imaging agricultural land. It is essentially a drone that performs observations and surveillance in flight. Before sending the drone into the air, farmers tell it which area to map and select a land resolution or altitude. Every drone can detect weather conditions using artificial intelligence, so it chooses the best flight path to take based on things like wind speed or air pressure. During the flight, the drone collects visual, thermal, and multispectral images; then lands in the same place it took off. (Now is a cool and useful Internet of Things farming tool!) 5. Precision Planting's Corn Maze Radar Family Farms began as a pumpkin farm in the 1990s, and today offers a 10-acre corn maze to visitors every fall. In the beginning, the family created the maze by planting all 10 acres of corn and then hiring a company to cut out the shape of the maze. This was a waste of seeds—and a waste of money. By using Precision Planting technology, they are now able to plant in the form of the map—something they think no other farm in the United States does. 6. TeamDevs Libelium Network For Tobacco Crop Quality Tobacco is a large industry in Italy and requires certain environmental and climate requirements for optimal growth. In response to this problem, an Italian software company-TeamDev-deployed Libelium's Waspmote Plug & Sense platform to collect data on weather conditions that could affect tobacco crops. This technique can be used by tobacco growers to optimise their crops under conditions not usually suitable for tobacco growth. 7. JMB North America's Connected Cows JMB North America has brought out an IoT solution that helps ranchers monitor pregnant cows preparing to give birth. A battery-powered sensor is expelled from the heifer when its water breaks, sending a notification to the rancher or shepherd manager. The sensor allows farmers to be more focused in the time with pregnant heifers. 5 Engineering issues to consider before designing your Smart Farming Solution as shown in the examples above, there are a variety of IoT farming use cases to cover a mengeria of agriculture and livestock issues. If you are engineering a smart farming solution, there are specific focus areas to consider while expanding your product. 1. What will your application monitor? Farmers, farmers and industrial food producers are looking at IoT solutions to increase efficiency and yield and reduce loss and theft. In other words, they are looking to optimize resources and lower costs. Whatever end user, monitoring will be front-and-center as you design For For For a maize farmer may be primarily concerned with water use. He doesn't want to use too much water, but he also needs to be sure that enough water is getting where it's needed. Real-time monitoring, on the other hand, can help a rancher locate a sick cow in the flock before it contaminates the rest of the animals. Doing this will dramatically reduce livestock losses, and reduce the costs associated with the purchase of antibiotics needed to treat a large group. 2. How much wireless range is necessary? The distance that data needs to travel makes a huge impact on the type of technology that should be used. If you measure anything 10 feet away, you wouldn't use the same technique that you would use for anything 1500 feet away. For short distances, use radio frequency identification (RFID) or near-field communication (NFC), which is common in mobile phones. NFC or RFID can be used if you tag a feedbag and need to know how many pounds of soybeans are in each bag. If you send data to an object that is 10 meters or closer, Bluetooth or Bluetooth Low Energy (BLE) may be a good option. A good example of this would be to construct a Bluetooth eartag for pigs living in a small area, which would tell an end user the ages of pigs and important information about them. If your application needs to send data over hundreds or even thousands of feet, you might be looking at low power (wide-area network) (lpwan) options. Some examples are Symphony Link or other sub-GHz technologies. An application over this type of network can be used to measure soil moisture in the field or to find and track livestock when grazing. This type of application is also ideal for monitoring fish farms that have large, fenced areas of aquaculture and are difficult to access. 3. Where does the power source come from? There is a very close correlation between battery life and range. A sensor that is very far away requires more energy to get information from one point to another. To get around it, IoT product creators often engineer programs to send much less data (or send data less frequently) to save on costs and power. So, you need to determine where your sensor application will draw power from. Given that most IoT farms are usually outside or spread over a large area, you need to consider a low power application. Otherwise, the service and maintenance of many remote sensors will be overwhelming for the end user. 4. How often does the end user need to collect data? You might think that the more data packets a sensor can send better, but this isn't necessarily the case. The number of required data packets depends on many factors, including the end user application and the on-premises environment. For example, if a farmer has a moisture sensor in a remote potato field, he likely doesn't need to gather information every two seconds. Once or twice a time is probably enough, which means that the battery life will be much greater. On the other hand, an application that is to send GPS coordinates and other information retrieved by a tractor could easily send almost constant data packets back to the gateway. After all, a tractor offers a perfect (and almost unlimited) power source, so large amounts of data or video streams can be sent without clogging the network. You can see how this is very different from our moisture sensor example, which does not have a constant power source. Another example is a comparison of tank leveling and irrigation. Many farms have large tanks like house fertilizer, fuel, or livestock feed. Monitoring the levels of these tanks more than once a day is probably unnecessary. On the other hand, when irrigation is on, continuous updates can ensure that the right amounts of water are discharged and that there is no leak. All this to say: Before creating an M2M farming application, make sure you consider how much data is too much. 5. What kind of sensors are necessary, and how will they be interface? Each wireless sensing technique is different, so you want to consider which ones to use and how you'll be interfacing with them before you get started. Some sensors—like moisture sensors—are embedded, and require microcontrollers to interface. Creating the sensor and weatherizing it is a technical challenge that would need to be met. Positioning the sensor for an optimal communication path is another technical challenge. If sensors are placed in an orange orchard, the trees can interfere if the antennas are not mounted correctly. This is obviously not as big a challenge if an antenna is mounted in a strawberry field. In conclusion, remember this: The technology you engineer in your IoT farming application should not be an obstacle to what the end user is trying to measure. So make sure you understand what your end user needs to measure, then choose a solid technology to build around to get that information out. Let's get your IoT farming application to market. Since they do not rely on third-party Wi-Fi or 3G connections, low-power LPWA connectivity options such as Symphony Link have greater reliability and scalability even across a large holding. Download the brochure below to learn more about how Symphony Link can help connect your IoT farming application. If you have questions, let's talk. Talk.

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