

Smart Farming Education Service based on u-learning environment

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Abstract— Smart farming education service focuses on the dissemination of farming information. This farming information is supposed from current activities, farming product and from the experience of farmer on the field. If the information is not available, or if available and not in a form that is amenable to being brought to the end producer then the process stalls at this point. The core component of the automation process is the creation of a data store which will be a repository for this information. The farming sector will benefit immensely from the implementation of farming data in farming contents repository which will serve as the knowledge base for the automation process.

Keywords— Smart Farming Education, Web object, uSDL, ubiquitous self-directed learning, ICT,

INTRODUCTION

Smart farming education service is required for dissemination of farming information that is very important for the smooth deployment of smart farming. This paper covers the following issues of the smart farming education service based on u-learning environment:

- Providing precision farming and education information regarding seeding, planning, soil typing, crop health, and yield modelling;
- Upgrading farming knowledge by self-directing learning;
- Knowledge based farming skill applying big data and cloud computing technology;
- Education not limited with space, place, and time.

CONCEPTUAL MODEL

Due to the fact that they are free of space and time restrictions, ICTs allow a great number of different farmers to participate in education by increasing the flexibility of participation.

Smart farming education service is a potentially viable and cost-effective way to facilitate knowledge development among farm professionals and farmers. Smart farming education service focuses on the dissemination of farming Information. This farming information is supposed from current activities, farming product and from the experience of farmer on the field. If the information is not available, or if available and not in a form that is amenable to being brought

to the end producer then the process stalls at this point. The core component of the automation process is the creation of a data store which will be a repository for this information.

The farming sector will benefit immensely from the implementation of farming data in farming contents repository which will serve as the knowledge base for the automation process. The conceptual model of smart farming education service is shown as Figure 1.

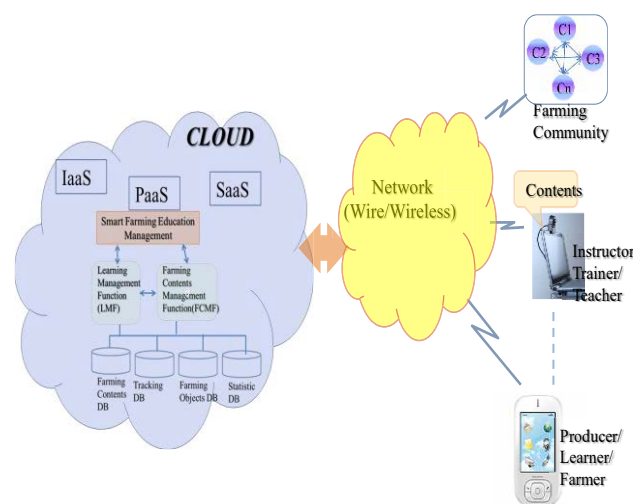


Figure 1. Conceptual model of smart farming education service.

Reference architecture of application model for smart farming education service

The architecture shall be adequate for farmers' characteristic. An application model for smart farming education service consists of sensor searching function, contents learning function, information connection function, and farming management function in education service platform of cloud as shown in Figure 2.

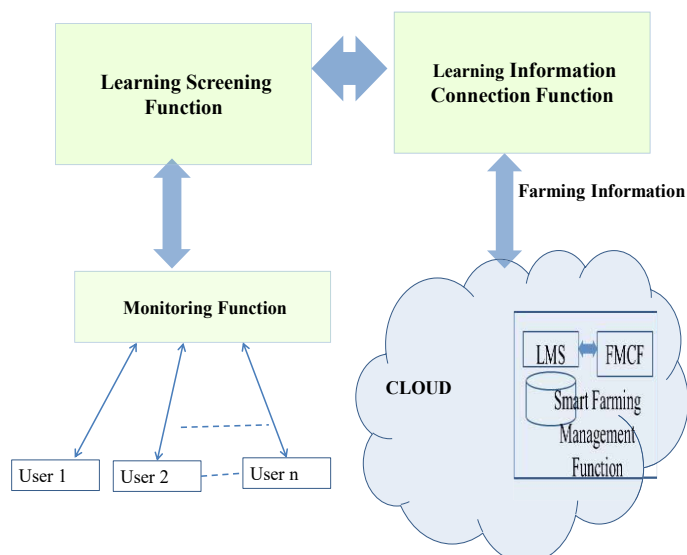


Figure 2. Reference architecture of smart farming education service.

Smart farming management function in the Cloud as a PaaS of farming education provides;

- Provide context –aware computing and adaptive learning service;
- Include LMS(Learning Management Function) and FCMF(Farming Content Management Function);
- Major needs(Cost effectiveness, Reliability, Adapting to the lifestyle, Timely sensitive content, Adapting to multiple teaching and learning styles).

SERVICE RE SCENARIOS FOR APPLICATION MODEL OF SMART FARMING EDUCATION SERVICE

Smart Farming based on networks is a service scenario that uses IOT networks to actualize a convergence service in the agricultural field to attain more efficiency and quality improvement and to cope with various problems.

In particular, this defines service capabilities for Smart Farming, provides a reference model for Smart Farming, and identifies network capabilities required to produce an infrastructure which supports Smart Farming to build the smart agriculture, namely smart farming by proposing a content object model of web objects based uSDL. The information model of uSDL content objects is in accordance with [ITU-T Y.2241].

It describes requirements of smart-farm for monitoring, controlling, managing, and operating based on IOT technology in protected horticulture. Through the virtualization of smart-farm resources, the standard provides smart-farm service and defines service components of smart-farm(FaaS, Farm as a Service) for managing and developing.

Smart-farm service contains three functions of management service and two functions of simple/complex control service, a function of farm operation service services below.

- management service based FaaS : Equipment Management Service(EMS), Data Management Service(DMS), Model Management Service(MMS)
- simple/complex control service based FaaS : Farm Monitor Service(FMS), Farm Control Service(FCS)
- farm operation service based FaaS : Farm Operation Service(FOS)

In addition, smart-farm using cloud platform could have several cases so it should be established and managed in varying way depending on cultivars, its size and type. Therefore, the standard chooses and describes 4 typical service scenarios below:

- Manual control support service;
- Remote control support service;
- Automatic control support service;
- Third-party support service.

To apply Smart Farming based on networks shown in Figure 3, Third-party architecture shows the service roles as a service providers with the public knowledge provider and the uSDL for smart agriculture through the FaaS(Farm as a service).

The functional features of uSDL which form the mobile learning with the mobility and pervasiveness or omnipresent education environment are characterized. It supports adaptive learning methodologies in accordance with learner's preference, learning situations and learner's understanding level as like as farmers.

The high-level IOT network capabilities for the support of Smart Farming are as follows:

- Support of tag-based devices (e.g. RFID) and sensor devices. Identification, naming, and addressing capabilities are essential for supporting "connecting to anything";
- Open web-based service environment capabilities: Emerging ubiquitous services/applications will be provided based upon an open web-based service environment as well as on legacy telecommunication and broadcasting services;
- Multi-networking capabilities with desirable QoS through redundancy and fault tolerance;
- Networking capabilities: provide relevant control functions of network connectivity, such as Internet of Things (IoT) and transport resource control functions, mobility management or authentication, authorization and accounting (AAA).

IT convergence with agriculture is expected to bring more efficiency and quality improvement in pre-production stage, Production stage, post-production stage of agricultural

products with the aid of information processing and autonomous control technologies of the IT area.

It carries out the specific projects as follows to build the Smart Farming after finalizing the reference model of Smart Farming:

- Metadata on Distribution Management of Agricultural Products;
- Agricultural growth and distribution environmental monitoring sensor information management method;
- Smart-farm System and Service based on Platform of Cloud computing.

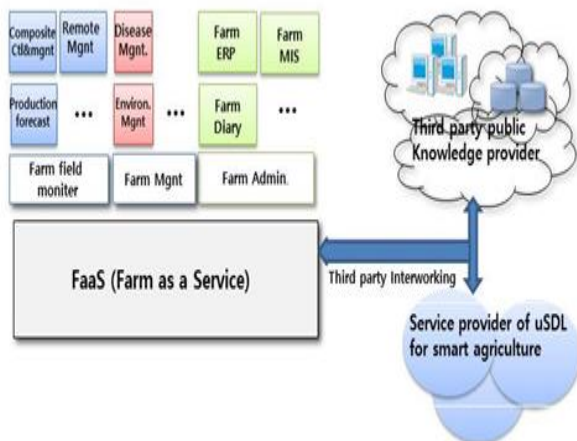


Figure 3. Service scenario of uSDL for smart-farm.

Figure 4 shows an example of the architecture on object tagging and customization of smart uSDL objects based on VO and CVO in educational materials. For instance, for the storage of static and dynamic metadata, a relational database (e.g., resource description framework (RDF), Ontology, VO/CVO) will be used to construct a web objects based uSDL environment. As indicated the WoO platform [ITU-T Y.4452] will support a web environment for dynamic and static metadata processing, and will create a self-directed smart learning service.

In order to support "educational objects customization", a content customizer is used to provide the smart uSDL program and allows it to create features equivalent to LOM features. In the visualization scenarios, smart featured user interface/user experience (UI/UX) will also be supported through the customer devices.

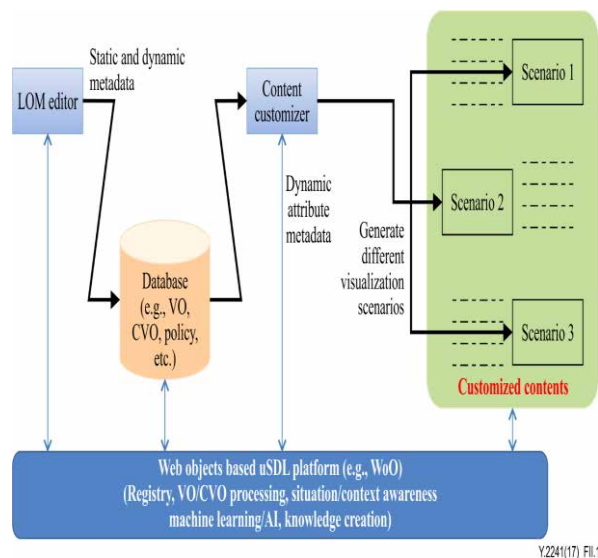


Figure 4 – Scenarios of the architecture on object tagging and customization of smart uSDL objects.

Based on the descriptions of Figure 4, the operational procedure of web objects based uSDL system. The management functions for service, uSDL CVO and uSDL VO performs the control and management functions to support uSDL educational service capabilities. In order to provide personalized and intelligent features in web objects based uSDL environment, the enhanced capabilities of situation/context awareness, machine learning and artificial intelligence (AI) will be performed.

CONCLUSIONS

While uSDL should provide the functions with the flexibility and efficiency, ICT achieves in ubiquitous environment of interactive access of farmers to variety of multimedia based materials to get the smart farming education service of mind and attitude to adoption of technological change and dissemination of education service contents to farmers. Smart farming education service disseminates to the farmers for the farming contents and perform farmers problem back to education service system for solution to help farmers make decision in farm management. That is smart farming education service which assists farmers to develop proficiency in the management of farms.

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