Exploration on Curriculum Policy for the Internet-of-Things Engineering

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Abstract. The "Internet-of-things" (IOT) Engineering is an interdiscipline， it involves so many courses and puts us in chaos when course choice is needed. Based on its layer architecture, this paper analyzes the curriculum policy for IOT Engineering and its correlations with other professional courses, and finally presents a curriculum policy practice arrangement for it.

Introduction

IOT relates with many technologies, such as computer network, computing technology, embedded technology, sensor technology, wireless communication technology, and so on. IOT aims at exploring and utilizing all kinds of information resources in human world and physical world, and further improve the information communication between man and man , man and object, object and object, so far as to develops information and knowledge sharing, boosts to form information society that is omnipresent and omnipotent. IOT is the first step that informatization steps into the physical world, and will extend to ubiquitous network finally.

IOT Engineering is a new major that is under developing fast all of the world. In China, the development of IOT is promoted to a high significance with strategic development. Many colleges and universities are building or have already built the IOT Engineering to meet the potential talent desire in the future.

At present, IOT Engineering is just starting out, every college and university makes its curriculum policy based on their present faculty and facilities with different emphasis on professional basic courses and major courses.

Architecture of the IOT

IOT has architecture with three layers, as shown in Figure 1.

Sensor layer includes sensor technology, sensor-based data collection technology, and wireless ad-hoc network technology.

Transport layer includes supporting and accessing technology, such as private network, remote control, wireless M2M technology, mobile communication technology, Internet, next generation network(NGN), and heterogeneous network integration, etc.

Application layer includes all kinds of IOT middleware, such as information management, service management, user management, etc.

Additionally, to realize interconnections among objects, cross-layer technology is needed., including identification management resolution, network's and system's security, quality of service, etc..

Diversity in Data Collected. Sensor layer identifies objects by two dimension code, RFID and wireless sensor network (WSN). The data collection terminals can be mobile, computer, RFID device, GPRS and sensors.

Ubiquity in Transport Networks. Transport layer transports and computes the data from Internet, broadcast and television network, communication networks, and NGN, etc. The present Internet, mobile network and networks all can be information medium in IOT.

Intelligence in Data Processing

Application layer is the input-output terminals, computing and processing data and information from transport layer. With cloudy computing technology M2Mis realized.

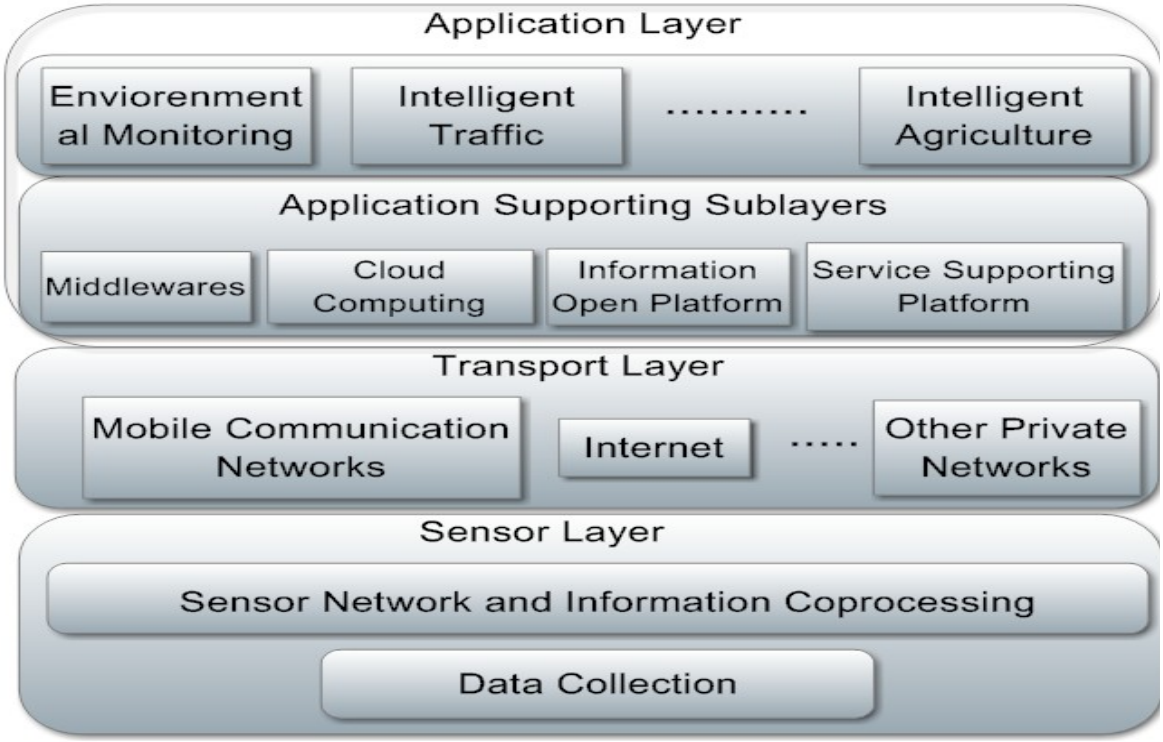

Figure 1. IOT architecture with three layers

Fundamental Curriculum Tree for IOT Engineering

As the IOT architecture shown in figure1, and the characteristics in IOT discussed above, core curriculum branches for IOT Engineering are shown in diagrams from Figure 2 to Figure 4, and the core professional curriculum is shown in Figure 5:

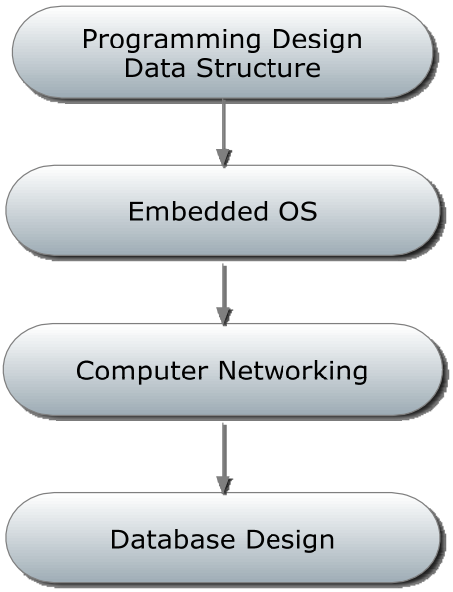

Figure 2. Branch from programming to database design

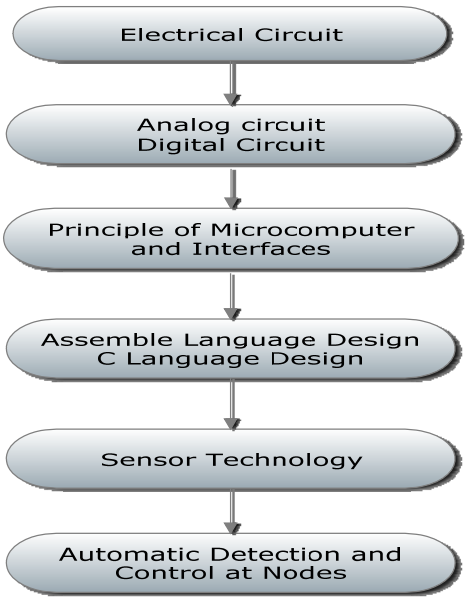

Figure 3. Branch from electrical circuit To automation control

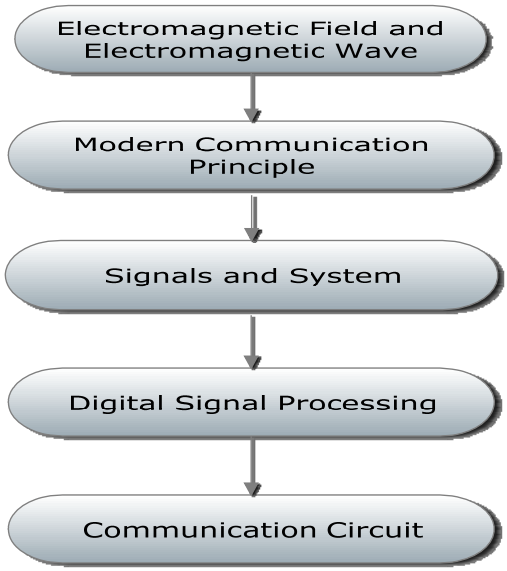

Figure 4. Branch from electromagnetic field and electromagnetic wave to communication circuit

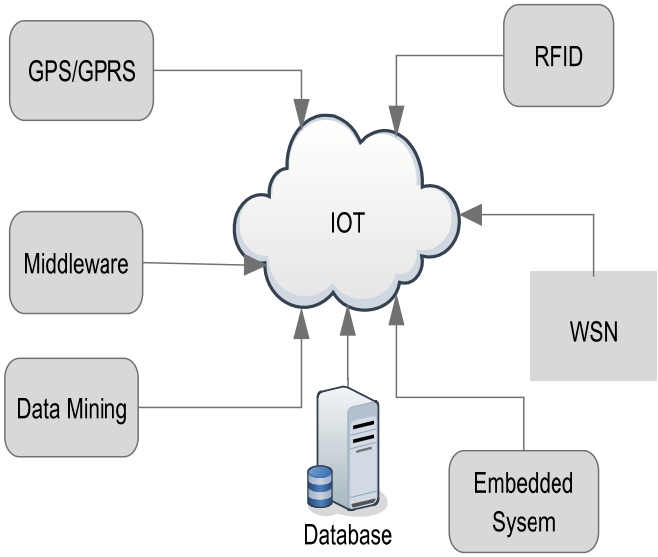

Figure 5. Core professional curriculum for IOT Engineering

The Practical Arrangement

As motioned above, IOT Engineering is a interdisciplinary and needs more practice.

Fundamental Skills' Training. Fundamental skills' training is always important to the further professional study.

The basic units in our everyday life and in automation devices are always electric or electrical parts. It is very important for students to assemble and debug a basic electrical device after analog and digital circuit courses.

As machine language, assemble language programming should be carried out to make students understand how CPU works and how to use its ports after the relevant courses ends.

Professional Practices. As shown in Figure 5, professional practices should include nine aspects:

Sensor principle practice
C/C++/C# programming practice
Embedded system practice
Communication practice
Automation practice
Computer network practice
RFID practice
WSN practice
Automation practice

IOT Engineering Training. IOT Engineering training includes:

Intelligent traffic
Intelligent distribution
Smart home
Smart agriculture
Smart library management
Smart laboratory management
And so on.

Conclusion

As an interdiscipline, the curriculum policy for IOT Engineering must cover the main courses related in the three layers.

Additionally, IOT Engineering emphasizes on practice, the relative practical training and designs should be included.

References

[1] Huang Peng, Yang Yunzhi, in: *the Internet of Things Bosts RFID and Communication Networks*. Telecommunication Engineering, Chengdu, vol. 50(2010), p. 85-89.

[2] Shen Subin, Fanquli, in: *Study on The Architecture and Relatice Technologies of IOT*. Journal of Nanjing university of posts and telecommunications, Nanjing, vol. 29(2010), p.1-11

[3] Zhu Jinxiu, Han Guangjie, Zhu Chuan, Wudi, in: *Study and Research on the Curriculum Architecture of IOT*. China Power Education, Beijing, vol. 16(2012), p. 67-68

[4] Hu Zhongwang, in: *Design of Professional Curriculum Architecture of IOT*. China Power Education, Beijing, vol. 22(2010), p. 67-68

[5] Gui Xiaolin, in: *Exploration on the Professional Curriculum of IOT*. Computer Education, Beijing, vol. 16(2010), p.1-3

[6] Son Jun, Wang Yifeng, Xu Feng, in: *Reform in the Teaching of embedded systems in IOT*. Laboratory Science, Beijing, vol. 1(2011), p. 20-22

[7] Shen Subin, Mao Yanqin, in: *The Concept Model and Architecture of IOT*. Journal of Nanjing university of posts and telecommunications, Nanjing, vol. 4(2010), p.1-8