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SMART CITY LIGHTING MANAGEMENT AND ENERGY CONSERVATION

M.ANUSHA DEVI[1],Mr.N.BALA SUBRAMANIAN [2],M.SABARI RAMACHANDRAN[3], M.MOHAMED RAFI[4]

1, Student, Department of Master of Computer Application. Mohamed Sathak Engineering College. Ramanathapuram, India.
2, Assistant Professor, Department of Master of Computer Application, Mohamed Sathak Engineering College. Ramanathapuram, India.
3, Assistant Professor, Department of Master of Computer Application, Mohamed Sathak Engineering College. Ramanathapuram, India.
4, Head of the Department, Department of Master of Computer Application, Mohamed Sathak Engineering College. Ramanathapuram, India.

ABSTRACT

In this project a prototype using IOT-based Low-power wide-area network (LORAWAN) and software technology was developed for the energy efficient management in smart homes and a study was made on possible consumer interaction solutions, using Python 3.7 and various Internet of Things web platforms. Another objective, to compare the software prototype with wireless technology, is also achieved. Wireless sensor networks (WSNs) are mainly characterized by their limited and non-replenishable energy supply. Hence, the need for energy efficient infrastructure is becoming increasingly more important since it impacts upon the network operational lifetime. Sensor node clustering is one of the techniques that can expand the lifespan of the whole network through data aggregation at the cluster head. In this paper, we present an energy-aware clustering for wireless sensor networks using particle swarm optimization (PSO) algorithm which is implemented at the base station. We define a new cost function, with the objective of simultaneously minimizing the intra-cluster distance and optimizing the energy consumption of the network. The performance of our protocol is compared with the well known cluster-based protocol developed for WSNs, LEACH (low-energy adaptive clustering hierarchy) and LEACH-C, the later being an improved version of LEACH. Simulation results demonstrate that our proposed protocol can achieve better network lifetime and data delivery at the base station over its comparatives.

INTRODUCTION

Wireless Sensor Networks (WSNs) consist of large number of sensors which having capabilities such as sensing, computing, and communicating. Beside these features, sensors have limited computational and communication power. Therefore, energy is a challenging issue in WSN networks. Clusters-based routing protocols are used to maximize network lifetime. In this project, I propose a new combination of PSO algorithm to reduce energy consumption and extend network lifetime. The proposed method, reduce energy consumption by finding the optimum number of cluster head (CHs) nodes using improved PSO. To balance energy distribution, a k-means-based algorithm, dynamically cluster the network.

PROJECT DESCRIPTION

The study of Wireless Sensor Network is focused mainly on increasing the values of two main parameters like network lifetime and information reliability. All the algorithms and routing techniques applied on such networks try on their best effort to improve the performance and to have as

result the most convenient values of both parameters. Lifetime and reliability are crucial in all kind of WSN application but especially in underwater as the case of this work. The main contribution of the paper consists in studying the behavior of the network while varying the different parameters like node distance from each other, node selection criteria for the different node roles in the network, definition of network lifetime duration, etc. Simulations show that due to these parameters the network decides itself when to stop functioning. The network lifetime becomes flexible based on the specific requirements of user applications.

The focus of this project is to design a *system* of street *lights* controller to provide a reduction in *power* consumption. In the *system*, we *analyze* the actual value brought by *energy efficiency* management technology through case studies. Thus, *energy saving* is a key point in the context of *smart cities*; in this paper, we focus on the achievable *energy savings* by adopting algorithm . The Dynamic street lightening *system* is designed for *energy saving* through *automation*, which is best ever solution for electric consumption

System Testing

Testing is a process of executing a program with the intent of finding an error. Testing is the crucial element of software quality assurance and presents ultimate review of specification, design and coding. System testing is an important phase. Testing represents an interesting anomaly for the software. Thus a series of testing is performed for the proposed system before the system is ready for the user acceptance testing. A good case is one that has a high probability of finding an undiscovered error. A successful test is one that uncovers an undiscovered error.

Type of Testing

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement

UNIT TESTING

Unit testing is the testing of each module and the integration of the overall system is done. Unit testing becomes verification efforts on the smallest unit of software design in the module. This is also known as ‘module testing’. The modules of the system are tested separately.

INTEGRATION TESTING.

Data can be lost across an interface, one module can have an adverse effect on the other sub function, when combined, may not produce the desired major function. Integrated testing is systematic testing that can be done with sample data. IntegrationTest Casediffers from other test cases in the senseit focuses mainly on the interfaces & flow of data/information between the modules. Here priority is to be given for the integrating links rather than the unit functions which are already tested. The need for the integrated test is to find theoverall system performance.

FUNCTIONAL TESTING

Functional testing is a quality assurance process and a type of black-box testing that bases its test cases on the specifications of the software component under test. Functions are tested by feeding them input and examining the output, and internal program structure is rarely considered (unlike white-box testing). Functional

testing is conducted to evaluate the compliance of a system or component with specified functional requirements.[3]Functional testing usually describes what the system does. Since functional testing is a type of black-book testing, the software's functionality can be tested without knowing the internal workings of the software.

OUTPUT TESTING

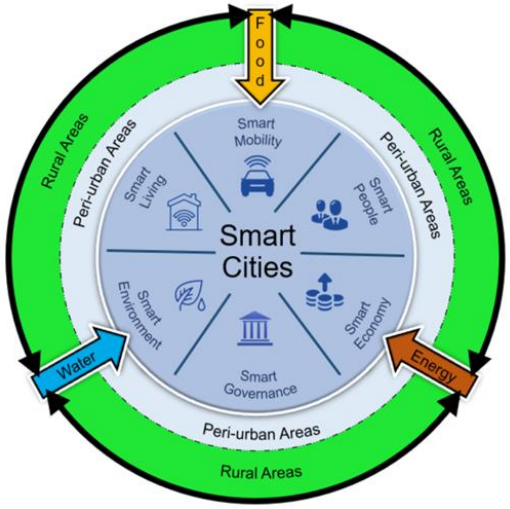
After performing the validation testing, the next step is output asking the user about the format required testing of the proposed system, since no system could be useful if it does not produce the required output in the specific format. The output displayed or generated by the system under consideration. Here the output format is considered in two ways. One is screen and the other is printed format. The output format on the screen is found to be correct as the format was designed in the system phase according to the user needs. For the hard copy also output comes out as the specified requirements by the user. Hence the output testing does not result in any connection in the system.

SYSTEM IMPLEMENTATION

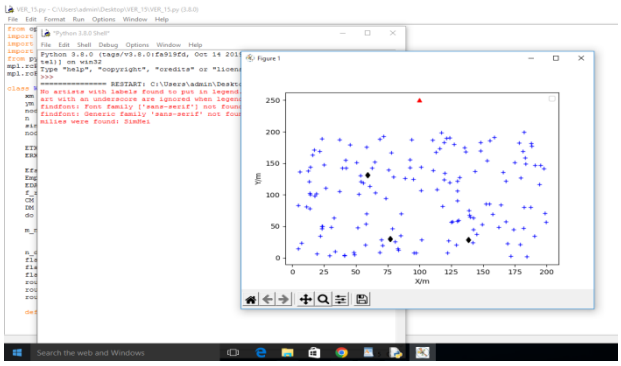
As the energy conservation and environmental protection take more and more attentions, energy saving is becoming increasingly vital. We can detect environment condition automatically through intelligent control and adjust environment's parameters according to the demands of people's behavior so as to meet people's demand and save energy. This paper aims to construe a intelligent lighting energy saving system. In this paper, we use constructed intelligent lighting energy saving system, the hardware of which adopt sensor network technology, and that can implement without destroying the original lighting system. Since it can not only reduces the cost of renovation, but also saves electricity. The system's hardware is composed of wireless sensor node module and lighting node module. As an important component the system software, Lighting control algorithm is the core of the whole system.

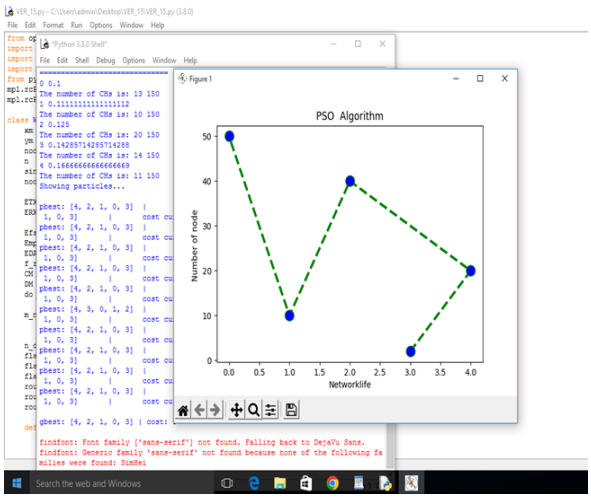
SYSTEM DESIGN

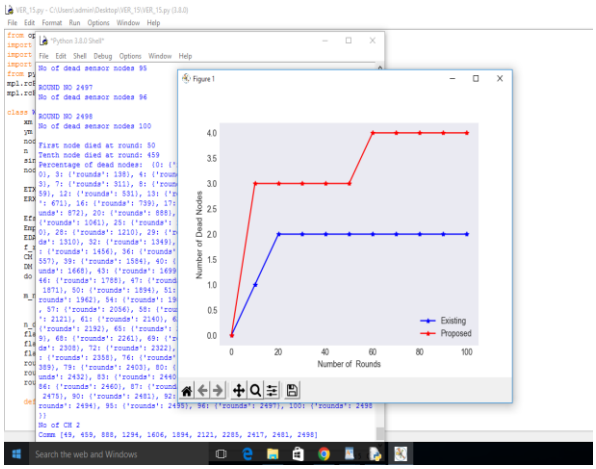
ARCHITECTURE DIAGRAM



SCREEN SHOTS







Conclusion

By using Smart Street light, one can save surplus amount of energy which is done by replacing sodium vapor lamps by LED and adding an additional feature for security purposes. It prevents unnecessary wastage of electricity, caused due to manual switching of streetlights when it's not required. It provides an efficient and smart automatic streetlight control system with the help of IR sensors. It can reduce the energy consumption and maintains the cost. The system is versatile, extendable and totally adjustable to user needs. Street-lights are a large consumer of energy for cities using up to 50 percent of a city's energy budget. If every city installs the proposed system then a lot of power can be saved .Proposed system is power saving mechanism for street lights by using LED lamps as replacement of normal lamps and using special power savings mechanism for microcontroller. It turns out most reliable and time efficient way to switch ON/OFF streetlights. It provides an effective measure to save energy by preventing unnecessary wastage of electricity, caused due to manual switching or lighting of street-lights when it is not required. It adopts a dynamic control methodology for traffic flow. The proposed system is especially appropriate for street lighting in remote urban and rural areas where the traffic is low at times. The system is versatile, extendable and totally adjustable to user needs

7.2 Future Enhancements

The research work shows automatic control of street lights as a result of which power is saved to some extent. In the scope of industrialization, automation is a step beyond mechanization . Whereas mechanization provided human operators with machinery to assist the users with muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Basically, street lighting is one of the important parts. Therefore, the street lamps are relatively simple but with the development of urbanization, the number of streets increases rapidly with high traffic density. There are several factors need to be considered in order to design a good street lighting system such as night-time safety for community members and road users, provide public lighting at cost effective, the reduction of crime and minimizing it is effect on the environment. At the beginning, street lamps were controlled by manual control where a control switch is set in each of the street lamps which is called the first generation of the original street light. After that, another method that has been used was

optical control method done using high pressure sodium lamp in their system. Nowadays, it is seen that the method is widely used in the country.

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