



A survey – Energy harvesting sources and techniques for internet of things devices

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ABSTRACT

Internet of Things (IoT) is a broad platform where various technologies help everyday devices to become smarter, more informative, communicative and intelligent. IoT devices need batteries to be powered and the lifetime of batteries is limited. Due to which there is a huge demand for energy sources that are competent enough to power IoT devices. Energy harvesting, accumulating and converting surrounding energy into usable energy, has emerged as a strong alternative to power devices. This paper discusses the need for harvesting the energy that arose in IoT devices. The methodology of different architectures and technology used in energy harvesting systems can be improved by understanding the survey on energy harvesting sources and techniques. The paper compiled various energy harvesting sources and techniques in tabular form which will act as a major input for researchers prior art pursuing in this field.

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1. Introduction

With every shift in our devices, IoT has become a widely spread technology. It has become a prominent need in our world. Due to IoT, there is a firm connection between the physical and digital worlds. It relies on the 3A concept: anytime, anywhere and any media. With the rapid development in IoT, it is expected that more than 20 billion devices will be connected to the internet. With growing demand, it is crucial for scientists and researchers to refine the characteristics of IoT like self-adapting, self-configuring, self-sustaining. IoT can be represented as a network of surrounding things that are connected to the internet such as vehicles, various sensors, devices that can communicate with each other directly or indirectly by sending/receiving data. An ample number of functional blocks are included in IoT devices to facilitate various services to other systems which require continuous monitoring, controlling, and identification, management, filtering and processing of data [1]. Most of the IoT devices are battery-powered. Batteries' main disadvantage is its limited life span and finite capacity to power devices. There are many solutions available but the most promising fuel to the next revolution is shifting

from battery-powered systems to self-powered systems. Technology that takes advantage of environmental or other sources e.g. solar, wind, kinetic energy, body heat, foot strikes etc. is called Energy harvesting. This harvested energy saves energy, increase the lifetime of the devices [2,6]. There are many papers discussing available energy, their management [39–41] and energy harvesting technologies [41,42]. However, there is a need to consolidate the sources, designs, and techniques for the efficient use of energy harvesting in devices.

The paper is organized as follows. Section 2 covers energy harvesting architectures and associated techniques used. Section 3 focuses on different solar energy harvesters available for various applications. Section 4 gives a deep insight view of energy harvesting sources. There is also a discussion on the different energy sources and energy harvesting techniques in tabular form. Finally there is a conclusion in Section 5.

2. Energy harvesting techniques and harvesters

Various energy harvesting architectures are classified into 1. Harvest-store-use 2. Harvest-use [3].

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