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A Fuzzy Logic-Based Method for Incorporating Ethics in the Internet of Things

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ABSTRACT

IoT is expected to have far-reaching consequences on society due to a wide spectrum of applications like smart healthcare, smart transportation, smart agriculture, smart home, etc. However, ethical considerations of AI-enabled smart devices have not been duly considered from a design perspective. In this paper, the authors propose a novel fuzzy logic-based method to incorporate ethics within smart things of IoT. Ethical considerations relevant to a machine context are represented in terms of fuzzy ethics variables (FEVs) and ethics rules. For each ethics rule, a value called scaled ethics value (SEV) is used to indicate its ethical desirability. In order to model flexibility in ethical response, the authors employ the concept of ethics modes that selectively allow scenarios depending on the value of SEV. The method offers a viable mechanism for smart devices to imbue ethical sensitivity that can pave the way for a technology society amenable to human ethics. However, the method does not account for varying ethics, as such incorporating learning mechanisms represent a promising research direction.

KEYWORDS

Ethics, Fuzzy Logic, Internet of Things, Social implications

1. INTRODUCTION

The novel networking paradigm of the Internet of Things (IoT) proposes to connect virtually all things in the physical world to the global Internet. The idea is to embed communication and processing abilities in ordinary objects to gather relevant data from their environment, send it to cloud for processing and ultimately provide smart end user services. IoT smart services encompass a gamut of application domains such as smart healthcare, smart transportation systems, smart grid, industrial automation, smart buildings, environmental monitoring, smart homes, smart city etc (Al-Fuqaha et al., 2015). The advanced services offered by IoT are poised to revolutionise the modern society. With a staggering market share of $ 2.7 trillion to $ 6.2 trillion by 2025 (Manyika et al., 2013), strategic importance of IoT vision is evident and such academia and industry are working closely to realise the dream.

Sensors embedded in everyday things, devices, gadgets, smart phones, buildings, roads etc. would have the ability to gather gigantic amounts of personal, organisational and strategic state data. For example, smart cars, smart TVs, smart phones, smart beds etc. may gather large volume of household information that is highly private and sensitive in nature. While collection of certain data may be necessary to provide smart applications, not all trifling details need to be sensed. Unbridled collection

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