Abstract

Context Awareness is the mechanism through which systems can adapt to the needs of a user by monitoring the context. Context includes environment, spatial, temporal, etc. information that is used to infer the current activity. UML is used to design a context aware system. The context aware system is viewed as an Object Oriented software product. The UML model is generated through ArgoUML, a free UML modelling tool. The Use Case Diagram, the Sequence Diagrams and the Class Diagram are modelled using this tool. The Class Diagram is subjected to CK metrics to identify the strengths and weaknesses of the design. The measurements show that the proposed model is within the recommended range.

Keywords: CK Metrics, Context Aware System, Context Awareness, UML

1. Introduction

Context awareness is the ability of a system to be aware of its surroundings and recognize the activity. This encompasses the applications, services, devices, sensors and human users bounded within an environment (Schilit, Hilbert, & Trevor, 2002), (Mokhtar, Fournier, Georganates, & Issamy, 2006). The information gathered from these participants is collectively called as ‘Context’ (Mokhtar, Fournier, Georganates, & Issamy, 2006). The context is then used to identify the activity using learning mechanisms (Mahmud & Javed, Context Inference Engine (CiE): Inferring Context, 2012), (Malik, Mahmud, & Javed, 2007), (Mahmud & Javed, Context Inference Engine (CiE): Classifying Activity Of Context Using Minkowski Distance And Standard Deviation Based Ranks, 2014). Context awareness is the ability of systems to identify the users context and deliver better services based on their needs (Mahmud, Iltaf, Rehman, & Kamran, 2007), (Knappmeyer, Kiani, Reetz, Baker, & Tonjes, 2013). Since Weiser’s vision, context aware computing has evolved from context aware applications to platforms that classify current activity based on the context (Strang & Linnhoff-Popien, 2004), (Weiser, 1991).

Unified Modelling Language (UML) is a software design mechanism to model Object Oriented software systems as an agile technique. The UML is a rich visual paradigm that is easily converted to object oriented code in Java, C#, VB, etc (Object Management Group, 2014), (Miles & Hamilton, 2006), (Page-Jones, DOI: 10.4018/IJAPUC.2015010101

Copyright © 2015, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.
UML is widely used and provided different diagrams to represent the different stages of software development. This includes Use cases, Sequence diagrams, Class diagrams, Deployment diagrams, Activity diagrams, etc (Ambler, 2001).

The participants of a context aware system can be organized as the user and the services. The user includes the interaction and smart devices owned by him (Mahmud, Farooq, Javed, & Malik, 2012), (Mahmud, Iltaf, & Kamran, Context Congregator: Gathering Contextual Information in CAPP, 2007). The contextual data once gathered is then classified to ascertain the activity of the context. The classification can be a rule based, ontology based or may employ leaning mechanism (Mahmud, Iltaf, Rehman, & Kamran, 2007), (Malik, Mahmoud, & Javed, 2007). This activity information is then shared with the applications so that they may be adjusted and tuned according to the activity e.g., alarms may be triggered based on the health state of a patient (Kuo, Lee, & Chung, 2010). Thus, context aware systems integrate the numerous small and inexpensive devices to provide better services to the users.

This paper presents the UML Model of a supervised, contextual activity classification, context aware system based on Minkowski distances and standard deviation based ranks (Mahmud & Javed, Context Inference Engine (CiE): Inferring Context, 2012). The results of classification are published previously (Mahmud & Javed, Context Inference Engine (CiE): Classifying Activity of Context Using Minkowski Distance and Standard Deviation Based Ranks, 2014). Section 2 presents the literature review. The UML model is provided to highlight the Object Oriented development of the published system in Section 3. This paper presents the Use Case Diagram, Sequence Diagrams and the Class Diagram of the proposed system. The UML Model has been created using ArgoUML an open Source UML tool (Tigris.org, 2011). The Class diagram is evaluated using the CK metrics to identify its strengths and weaknesses in Section 4 (Chidamber & Kemerer, 1994), (Williams & Heckman, 2008), (Aivosto Oy), (Arapidis, 2012), (Kan, 2003). This paper concludes in Section 5.

2. RELATED WORK

The first generation of context aware systems delivered services based on the location of the user (Want, Hopper, Falcao, & Gibbons, 1992), (Cheverst, Mitchell, & Davies, 1999), (Abowd, Atkinson, Hong, Long, Kooper, & Pinkerton, 1997), (Román, Hess, Cerqueira, Campbell, & Nahrstedt, 2002), (Hofer, Pichler, Leonhartsberger, Altmann, & Werner, 2002), (Wang Y.-K., 2004), (de Deugd, Carroll, Kelly, Millett, & Ricker, 2006). Dey developed a context tool-kit that allowed developers to create context aware applications (Dey & Abowd, 1999). This toolkit was widget based and was not loose coupled. The first generation context aware system did not include comprehensive information about the surroundings e.g., illumination, temperature, role, battery power, load etc. The full potential of context is realized in the second generation of context aware systems (Riaz, Kiani, Lee, Han, & Lee, 2005), (Chen, Finin, & Joshi), (Mahmud, Iltaf, Rehman, & Kamran, 2007). These first generation systems are Rule Based Approaches (RBA) that identify the activity of the current context by firing rules (Chen, Finin, & Joshi), (Mahmud, Iltaf, Rehman, & Kamran, 2007), (Gu, Pung, & Zhang, A Middleware for Building Context-Aware Mobile Services, 2004), (Fahy & Clarke, 2004).

Use of context matching is an improvement in RBA (Samulowitz, Michahelles, & Linnhoff-Popien, 2001). Context aware systems are restricted to the quantity and quality of the rules developed by the engineer (Wei & Chan, 2012). The alternate is to use leaning algorithms as part of Classification Based Approaches (CBA), (Korpipaa, Mantyjarvi, Kela, Keranen, & Malm, 2003), (Mayrhofer, 2004), (Blum, 2005), (Brdiczka, Crowley, & Reignier, 2007), (Yuan & Wu, 2008). The context aware system classifies the current context coupled with a degree of confidence by use of supervised learning
How to Deal with Sports Activity Datasets for Data Mining and Analysis: Some Tips and Future Challenges
www.igi-global.com/article/how-to-deal-with-sports-activity-datasets-for-data-mining-and-analysis/138593?camid=4v1a

Robust Object Detection in Military Infrared Image
www.igi-global.com/article/robust-object-detection-in-military-infrared-image/93000?camid=4v1a

Rough Set Theory Based User Aware TV Program and Settings Recommender
www.igi-global.com/article/rough-set-theory-based-user/71885?camid=4v1a