Abstract

The need of constant support and care for the elderly people with special needs is gradually increasing. It is becoming the primary challenge for most of the western countries and research society to innovate new effective approaches and develop novel technologies to address the demographics challenges of an ageing population. This thesis work is one attempt towards that. The thesis focused on research the approaches to provide cognitive support for users with cognitive disabilities through ICT-based technological solutions. The recent advancement of Artificial Intelligence and wireless sensor networks have shown potential to improve the quality of life of elder people with disabilities using current technologies. The primary objective of this thesis is to conduct research on the approach to provide support for the elderly users with cognitive disabilities. In our research conduct, we have defined a set of goals for attaining the objective of this thesis. The initial goal is to recognize the activities of the users to assess the need of support for the user during the activity. However, one of the challenges of the recognition process is the adaptability for variant user behaviour due to physical or psychological disabilities. Therefore, an adaptive user modelling approach is proposed to capture the changing behaviour and capabilities of the user. Amongst different types of recognition techniques, a hybrid activity recognition approach is proposed with a probabilistic model to recognize the activities for higher accuracy and reliability. The second goal focus on the selection process of the type support required for user based on the aptitude of performing the activities. The capability model has been extracted from International Classification of Functioning, Disability and Health (ICF), a well-known framework to measure the individual health status and functioning level. The third goal is to develop an approach for supporting for users with irrational behaviour due to cognitive impairment. To deal with this challenge, a Belief, Desire and Intention (BDI) agent based approach is proposed due to its mentalistic characteristics, such as autonomy, adaptivity, extensibility, and human like reasoning capability. Although, BDI is unable to reason about plans, which is important for generating plans based on the current situation to handle the irrational behaviour of the user. An integration of Partially Observable Markov Decision Process (POMDP) in the BDI agent is proposed in this thesis to handle the irrational behaviour of the user. The fourth goal represents the implementation of the research approaches and performs validation of the system through experiments. The empirical results of the experiments conducted using the developed system shows potentials in terms of providing freedom of mobility for the user with cognitive impairment.