Research project objectives/Hypothesis:

The robots operating in unstructured environments must be capable of interacting with humans. Although social interaction between robots and humans is presently being extremely simple, one of the main goals of social robotics is to develop robots that can function in complicated settings such as homes, offices, and hospitals. To achieve this goal, robots must be capable of recognizing the intentions of the humans with whom they are supposed to interact. This presents both opportunities and challenges to researchers developing intention recognition techniques.

One of the main purpose of intention recognition is to improve the quality of life of elderly and/or disabled people, e.g. children with autism by helping them in their daily life activities. In the other words, robots, must interact with humans in a meaningful, flexible and adaptable manner, ideally by observing, recognizing and understanding the behavior of the humans.

In this project, new methodologies will be developed which will then be formulated to design new spatial-temporal model to predict the motion intention using visual information. The proposed experiments are expected to provide (a) alternate methods with improved resolution and dispersion for intention recognition; (b) automatic recognition of human activities by extracting the semantic representations. Apart from semantic representations, our work will consider on-line segmentation of motion sequences, with recognition and the capability of identification of the new activities.

Research methodology:

The aim of this proposal is to develop the tools for human-robot interaction in a known environment with unknown human motion intentions. Such tools can help elderly and children with autism to obtain robotised social assistance and service. Initially, the robot is observing the human action, over the time the human-robot interaction develops and improves. Before its own reaction, the robot hypothesizes subject's potential actions and selects that one that is found most suitable, it is the intention prediction. For such prediction the robot may also use the subject-robot interaction history. Along with the history, the robot also considers the action randomness and heuristic factor in action predictions.

The research plan includes the development of following kinds of experiments:

- Interaction selection considering unknown intention scenario;
- Probabilistic action selection;
- Action prediction;
- History based intention recognition.

Based on the type of information desired, the development of each of the proposed experiments requires careful consideration on the real time human-robot interaction .

Research project impact:

Research in the cognitive sciences, not least social neuroscience, has in the last 10-20 years made substantial progress in elucidating the mechanisms underlying the recognition of actions and intentions in a natural human-human social interactions and in developing computational models of these mechanisms. For research on human interaction with artificial agents such as robots in general, and mutual action/intention recognition in particular, it is therefore important to be clear about the theoretical framework(s) and inherent assumptions underlying technological implementations. This has further ramifications for the evaluation of the quality of the interaction (as opposed to the functioning of the robot itself) between humans and robots.

This proposal aims to expand the method for human motion intention recognition and developments of such methods are useful for service robot, e.g. children with autism and elderly caretaking in the field of human-robot interaction.