CHAPTER 1

INTRODUCTION

This chapter gives a description of the factors which motivated the research work. The problem is defined and the goals of the research work are discussed.

Intelligent Systems are expected to possess humanlike expertise in a specific domain wherein they can adapt themselves, learn to improve performance and explain their functioning. The essence of designing intelligent systems is neuro-fuzzy computing: neural networks which recognize patterns and adapt themselves to changes in the environment; fuzzy inference systems which incorporate human knowledge for inferencing. The integration of these approaches and certain optimization techniques gives rise to a novel discipline called Soft Computing which is employed to construct computationally intelligent systems.

> "Soft computing is an emerging approach to computing which parallels the remarkable ability of the human mind to reason and learn in an environment of uncertainty and imprecision" - Lofti A. Zadeh, 1992.

One goal of AI research is the creation and understanding of machine intelligence. Taken from this perspective, Soft Computing and Artificial Intelligence share the same goal. Soft computing is evolving under the influences of AI and has a direct bearing on machine intelligence.

1.1 MOTIVATION

Human emotion can be articulated through different kinds of media like images, speech, text, facial expressions, etc. Internet has evolved as a pervasive technology. The most prevalent means of communication on the web is in the form of text which is an affective medium to express informative content and attitudinal information. *Affect sensing* from text enables automatic expression of emotions in the cyber environment and building systems which can detect, understand and predict emotions is a technological challenge.

Emotion adds an element of life to communication and plays a vital role in the rational dealings of human communication. The capability to recognize emotions will augment the effectiveness of human-machine communication. Hence significant effort was spent in the past few years for developing emotion-oriented systems.

Aim of Artificial Intelligence is to build systems that behave like human beings, so it is essential to incorporate elements of both rational intelligence and emotional intelligence into the functionality of a computer system. In the future computers will need to connect with users on an emotional level in addition to performing multifaceted computations.

Intelligent systems are becoming a reality and in the next few years they are going to have a profound impact on the manner in which

human-made systems are conceived, designed, constructed and interacted with.

Another motivational factor is the wide range of applications of text-based emotion recognition in various fields as indicated below:

- Business: enables the marketers to develop strategies for CRM, for new product development and delivery in an effective manner.

- Education: construction of Intelligent Tutoring Systems and systems for Text-to-Speech conversion.

- Psychology: ability to predict state of mind by inferring emotions from the text written by people.

- Text based communication environments (blogs, mails).

- Human Computer Interaction (HCI).

- Behavior based control systems.

- Computational Linguistics. (opinion mining, market analysis, affective computing, natural language interfaces, e-learning environment)

The proposed research reinforces the functionality of the above areas to achieve the necessary goals. The work indirectly triggers an awareness of emotions and emphasizes the importance of emotional intelligence.

1.2 PROBLEM DEFINITION

Emotion recognition is an important aspect of Affective Computing. Emotional intelligence, which is a subset of Affective Computing, is generally realized using software (artificial) agents. These agents, when rendered with an element of emotion recognition can perform tasks in a more intelligent manner.

The objective of this research work is to develop an intelligent agent for automatic recognition of emotions from real life events. These events are in the form of text. The architecture used is based on Neuro-Fuzzy System (Mamdani model) [37], as it has the ability to generate additional fuzzy rules and membership functions automatically, so as to improve the knowledge base. The processing logic of the proposed system is developed using the JAVA framework; and the inference system is generated using MATLAB.

The system needs to be simple and more efficient when compared to the other keyword-based approaches. Several algorithms are designed and implemented for matching the words and for computing emotional values. These computed values, which denote emotions and their corresponding intensities, are compared to those expressed by the human annotators; and the efficiency of the system is determined based on the correlation. This is carried out in terms of precision and accuracy

metrics by using the standard mathematical formulae. The Agreement Analysis is done with the aid of a statistics package.

1.3 RESEARCH OBJECTIVES

Human beings possess two minds, one that thinks (rational mind) and one that feels (emotional mind). This results in two different kinds of intelligence i.e., rational and emotional. These two fundamentally different ways interact to perform decision making and other rational actions. Hence this research work intends to develop a system which endows a computer with an element of emotional intelligence.

Internet has emerged as an all-encompassing technology in the recent years and interactive systems are the main focus of the Internet Services. It is a technical challenge to build systems which can detect, reason, predict and understand human emotions; to process emotions in reasoning and during the interaction with a human user.

It has been proved that emotions are important in all aspects of human life by psychologists and therefore emotional agents (software agents for emotion recognition) have been taken into consideration by computer scientists. A speculative objective for building general models of emotion is that they could give insight into building models of intelligent behavior in the future. Several approaches like keyword based, statistical based, knowledge based, neural networks based, etc were used

in the past for the above-mentioned task. It is intended to develop a system with a novel approach in handling the task.

1.4 ORGANISATION OF THE THESIS

The content of this thesis is organized as chapters which gives a chronological ordering of the various activities performed in the research work and is briefed as follows :

Chapter 2 describes the various concepts relevant to the research, in a brief manner.

Chapter 3 gives an overview of the previous work done in the research area and describes the contributions of the present research work.

Chapter 4 describes the model of the system in detail by giving the architecture and the processing logic used to develop the system.

Chapter 5 portrays the implementation details and the corresponding screenshots of the results obtained.

Chapter 6 evaluates the performance of the system based on standard measures. It also performs a comparative study between the current system and other pertinent systems for a set of similar inputs.

Chapter 7 summarizes the research work and presents the limitations of present work and scope for future work.

This is followed by the Appendices with the supplementary information.