ABSTRACT

The primary objective of the thesis is to develop a multifunction knowledge based system in forensic science that will contain knowledge useful for many applications. Expert systems have so far proved their worth in medical diagnosis, design and maintenance. Forensic science consists of many subfields where knowledge is heuristic. There is literally no end to the number of disciplines that have become forensic by definition. Research has directed that a knowledge base containing explicit and declarative representations of the expertise, concepts and heuristic reasoning rules work efficiently to reason with judgemental or inexact knowledge about the nature of the task.

In most of the medico-legal cases the investigating authorities have to rely on the opinion of forensic expert. The forensic expert's first task is to assist the court in deciding whether or not a particular person has been involved in a crime. But it has been accepted by forensic experts, lawyers and jurists that involvement of human by way of interpretation may deny or delay justice to an innocent. So it is suggested in this thesis that expert systems can be used as an evidence expert.

Even though computers are used by forensic science departments in assessing evidence obtained in the course of
criminal investigations, as learning systems and for processing and communicating data, the application and usage of expert systems in this domain is very little. Few expert systems mentioned in literature have been built from commercially available expert system shells like EXPERT-4.

In this work, expert systems for toxicology, serology, firearm identification, criminology and filaments are developed using turbo prolog. A study of different knowledge representation techniques have been discussed, because it is essential to find representations of the knowledge contained in programs that are appropriate for the persons using them and for the experts who help to build them. With this in mind the expert system's knowledge base is built using logic which has the capability for representing procedural and declarative knowledge.

The database of the expert system on toxicology is available as symptoms and signs, laboratory findings, treatment and prevention techniques. Meta rules are used to minimize the number of analytical tests to confirm the presence or absence of a particular poison. The possibility of using this system as a poison information centre or as an evidence giver is discussed briefly. The expert system for serology identifies the blood groups.
This system works on the cumulative power of exclusion to exclude or include a putative father, so that it can be used to calculate the probability of inclusion or exclusion in a paternity or maternity case. The expert system for identification of fibers and hairs can be used by the investigators in physical evidence. The possibility of including or excluding a suspected firearm, has been discussed in expert system for firearm identification. In a sudden and unnatural death, the capability of classifying the death as homicide, suicide or accident is possible by an expert system. This is briefly discussed in the development of an expert system on criminology.

The advantages of using expert systems have been discussed. The efficient use of this system depend upon the well defined laws and repeated evaluation. Without well defined laws and repeated evaluation by experts to acknowledge the worth of the intelligence, the expertise of the system for evidence is as unreliable as that of corrupt experts.

*****