Chapter 7: Conclusions and Scope for Future Work

7.1. Conclusions

MASMEE system can help in reducing the time and effort involved in generation of test papers and evaluation of answers. The use of agents makes the system autonomous. The Examiner Agent is Goal oriented Agent that sets the test paper and performs evaluation on request of Student Agent. The Student Agent is the reactive Agent that serves the student requests such as authentication, taking the test, collecting answers and fetching marks.

Paper setting will be more efficient if the database of questions is large and with varied difficulty level. It is convenient in terms of time and effort to edit an auto generated paper than to make fresh test paper. The computer can work diligently as it is electronic device and therefore, errors due to fatigue and lack of concentration are eliminated. The time and effort involved in evaluation are optimized and the human evaluators need to only verify the evaluation.

The hybrid technique for subjective evaluation is capable of handling irrelevant answers. Sometimes students, who do not know the answers, write invalid content like repeating some keywords available in question paper itself in the answer. Such invalid answers are not given marks. The hybrid technique combines the best features of LSA and BLEU as observed from results and performs better than LSA and BLEU. It has advantages like semantic study and irrelevant answer identification both inherited from LSA and BLEU respectively.

For hybrid technique better results are achieved with use of best Model answer. However, statistical techniques like LSA and MAXENT give good results with use of Ontology instead of model answer.

The four step framework for practical evaluation enables thorough testing of student program. It performs evaluation on the basis of syntactic correctness, verification of output, metrics and semantic similarity between model program and student program. Marks are distributed based on these four steps proportionately. The compilation of student program checks for errors. The redundant error reports are removed by MASMEE which helps in better evaluation. If the student program does not compile in manual system then the human examiner has to spend time to identify the reason. The
testing step evaluates the student program against the test cases. The metrics such as lines of code, McCabe’s cyclomatic complexity are calculated to check the efficiency of the program. The system compares the logic of student program with model program using system dependence graphs to check whether student program has the required features and difference from model program. The developed framework will be helpful for the examiner in the evaluation of student practical examinations with minimum human intervention. Computerized evaluation ensures uniformity of evaluation, speedy and transparent results.

The automatic evaluation using computers looked impossible but as review progressed it seemed possible as a lot of Artificial Intelligence tools and techniques are available. The MASMEE system will not mark relevant as irrelevant and vice-versa. The system is reliable to a large extent.

7.2. Scope for Future work

The System may be extended to evaluate answers that may include equations, figures and tables generally used by students to answer questions. The Agent Model may be improved in several ways. The Student Agent may interact with Examiner Agent to provide the explanation for the scores whenever required. The Student Agent may send SMS to students as reminder for taking the test. Students may also be informed when marks are available.

The Subjective evaluation can be performed with soft computing techniques. It can also be performed with hybrid of BLEU and OLSA. The Objective module can be extended to evaluate short answers using Maximum Entropy with Ontology. The Practical module can be extended for evaluation of programming languages like LISP and SQL. The practical module can also be extended to handle multi-file programs.