



PROJECT REPORT

**Solving Minesweeper Game Using
Infer Knowledge and Consistency Test**

Feny Susanti 04.02.0065

2007

**FACULTY OF COMPUTER SCIENCE
SOEGIJAPRANATA CATHOLIC UNIVERSITY**

Jl. Pawiyatan Luhur IV/1, Bendan Duwur, SEMARANG 50234

Phone. 024-8441555 (hunting) Web : <http://www.unika.ac.id>

Email : ikom@unika.ac.id

APPROVAL AND RATIFICATION PAGE

PROJECT REPORT

Solving Minesweeper Game Using Infer Knowledge and Consistency Test

This Project Report has been approved and ratified by Dean of Faculty of
Computer Science on

With the approval,

Examiner,

Examiner,

Suyanto EA, Ir, M.Sc
NIP : 058.1.1992.116

Ridwan Sanjaya, SE, S.Kom,
NIP : 058.1.2002.252

Supervisor,

Dean of Faculty of Computer Science,

Daniel Adinugroho, ST, MIT
NIP : 058.1.2005.265

Ridwan Sanjaya, SE, S.Kom,
NIP : 058.1.2002.252

STATEMENT OF ORIGINALITY

I, the undersigned

Name : Feny Susanti

Nim : 04.02.0065

Hereby certify that the project I made was the result of masterpiece alone and it is not a plagiarism, except those started in print that it taken from other writing.

If it is proved in later days that the project is the result of rubbing, hence I settle for sanction.



Semarang, 22 January 2008

Feny Susanti

NIM. 04.02.0065

ABSTRACT

Minesweeper game is a logical game where the player must open all squares without detonating a bomb. The player should choose one of the square, but the player must be careful not to choose one which contain a bomb. If the player choose a square which contains no bomb, more information will be given to the player.

Minesweeper game that will be used is a board that consists of 9 x 9 squares and has 10 bombs. The location of bombs are spread out randomly in the board. Based on experience, with open 4 squares that is top left, top right, bottom left, and bottom right, the informations which get is enough to do infer knowledge process. Infer knowledge process will mark several squares as bomb and explore the safety squares. After infer knowledge process, the consistency test will be done when there are still uncovered squares. If the consistency test still not opened all squares, it means that it is no information can be used to deduced the bomb's location. In this case, user participation is needed.

Infer knowledge can be used to solve the Minesweeper game but there are several cases which are not solvable only using infer knowledge process. Hence, consistency test is needed to finish the game. Although, the consistency process can not always finish the game with win condition.

In few cases, there will be no more technique can be used to solve the game as no more information can be used to predict that a certain square contains a bomb. In this situation, user interaction is needed to decide which square will be explored.

Keywords : Minesweeper, Infer Knowledge, Consistency Test, Genetic Algorithm

FOREWORD

The project of Solving Minesweeper Game Using Infer Knowledge And Consistency Test has given me a lot of new experience and knowledge. All work, failure, and success in finishing this project is an implementation of all that I have got in the past three and a half year.

I couldn't finish this project and report without help from God and a lot of people. So in this opportunity, I would like to thank:

1. Jesus Christ for His blessing that He gave for me,
2. My parents for all support and love,
3. Mr. Ridwan Sanjaya, SE, S.Kom, as the Dean of Faculty of Computer Science for giving me some useful suggestions,
4. Mr. Daniel Adinugroho, ST, MIT, as supervisor for helping me and giving me ideas in finishing this project and leading me when I get stuck in problems,
5. Mr. Suyanto EA, Ir, M.Sc, as lecture which teach me basically make a program,
6. Lectures of Faculty of Computer Science Soegijapranata Catholic University which giving me more knowledge about programs.
7. All friends which help me to finish this project.
8. And also other people that can not be mentioned one by one.

Last but not least, I would like to apologize if I made mistakes in finishing the project and writing this report. Therefore, critics and suggestions are expected.

Semarang, January 2008

Feny Susanti

TABLE OF CONTENTS

COVER	i
APPROVAL AND RATIFICATION PAGE.....	ii
STATEMENT OF ORIGINALITY.....	iii
ABSTRACT.....	iv
FOREWORD.....	v
TABLE OF CONTENTS.....	vi
TABLE OF FIGURE.....	viii
TABLE OF TABLE.....	ix
CHAPTER I Introduction.....	1
1. 1 Background.....	1
1. 2 Scopes.....	2
1. 3 Objectives.....	2
CHAPTER II Literature Study.....	3
2. 1 Data Structured.....	3
2. 1. 1 Board.....	3
2. 1. 2 Bombs.....	3
2. 1. 3 Neighbours.....	4
2. 2 Algorithm.....	6
2. 2. 1 Explores Square.....	6
2. 2. 2 Infer Knowledge.....	6
2. 2. 3 Consistency Test.....	7
CHAPTER III Planning.....	9
3. 1 Research Methodologies.....	9
3. 2 Project Management.....	11
CHAPTER IV Analysis and Design.....	12
4. 1 Analysis.....	12
4. 1. 1 Use Case Diagram.....	12
4. 1. 2 Scenario.....	13
4. 2 Design.....	14
4. 2. 1 Algorithm.....	14
4. 2. 1. 1 Decision Behind Four Edges Exploration.....	14
4. 2. 1. 1. 1 Literature(Other Research).....	14
4. 2. 1. 1. 2 Heuristic Function (General Knowledge).....	14
4. 2. 1. 1. 3 Experiment.....	15
4. 2. 2 Module Decompositions.....	16
4. 2. 3 Class Diagram.....	17
CHAPTER V Implementation and Testing.....	21
5. 1 Implementation.....	21
5. 2 Testing.....	21
CHAPTER VI Conclusion.....	29
6. 1 Conclusion.....	29
6. 2 Further Research.....	30

REFERENCES.....31
APPENDIX



TABLE OF FIGURE

Figure 2. 1. Initial Board Representation.....	3
Figure 2. 2. Initial Bombs Representation.....	4
Figure 2. 3. Cell Position Is In The Corner.....	4
Figure 2. 4. Cell Position Is in The Edge.....	5
Figure 2. 5. Cell Position Is In The Middle.....	5
Figure 3. 1. Incremental Model.....	9
Figure 4. 1. Use Case Diagram.....	12
Figure 4. 3. Module Decompositions.....	16
Figure 4. 4. Class Diagram.....	17
Figure 4. 5. Class Diagram of Bomb, ViewGui, and Square	18
Figure 4. 6. Class Diagram of Board.....	19
Figure 4. 7. Class Diagram of Minesweeper	20
Figure 5. 1. New Board Game.....	22
Figure 5. 2. Explores Board In Top Left Corner.....	22
Figure 5. 3. Explores Board In Top Right Corner.....	23
Figure 5. 4. Explores Board In Bottom Left Corner.....	23
Figure 5. 5. Explores Board In Bottom Right Corner.....	24
Figure 5. 6. Board Game with Guessed Bomb Position.....	25
Figure 5. 7. Example of Board Game After User Click on The Next Button.....	26
Figure 5. 8. Example of Board Game After Infer Knowledge Again.....	26
Figure 5. 9. Board Game After User Choose a Safety Square	28

TABLE OF TABLE

Table 3. 2. Project Management.....	11
Table 4. 2. Probability test.....	15

