LTDU CIF 2009

Piloting e-Assessment of Diagrammatic Coursework

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Structure

- Intro about Myself
- Project
- Outcomes (Assessment Tool)
- Results of Evaluation
- Discussion

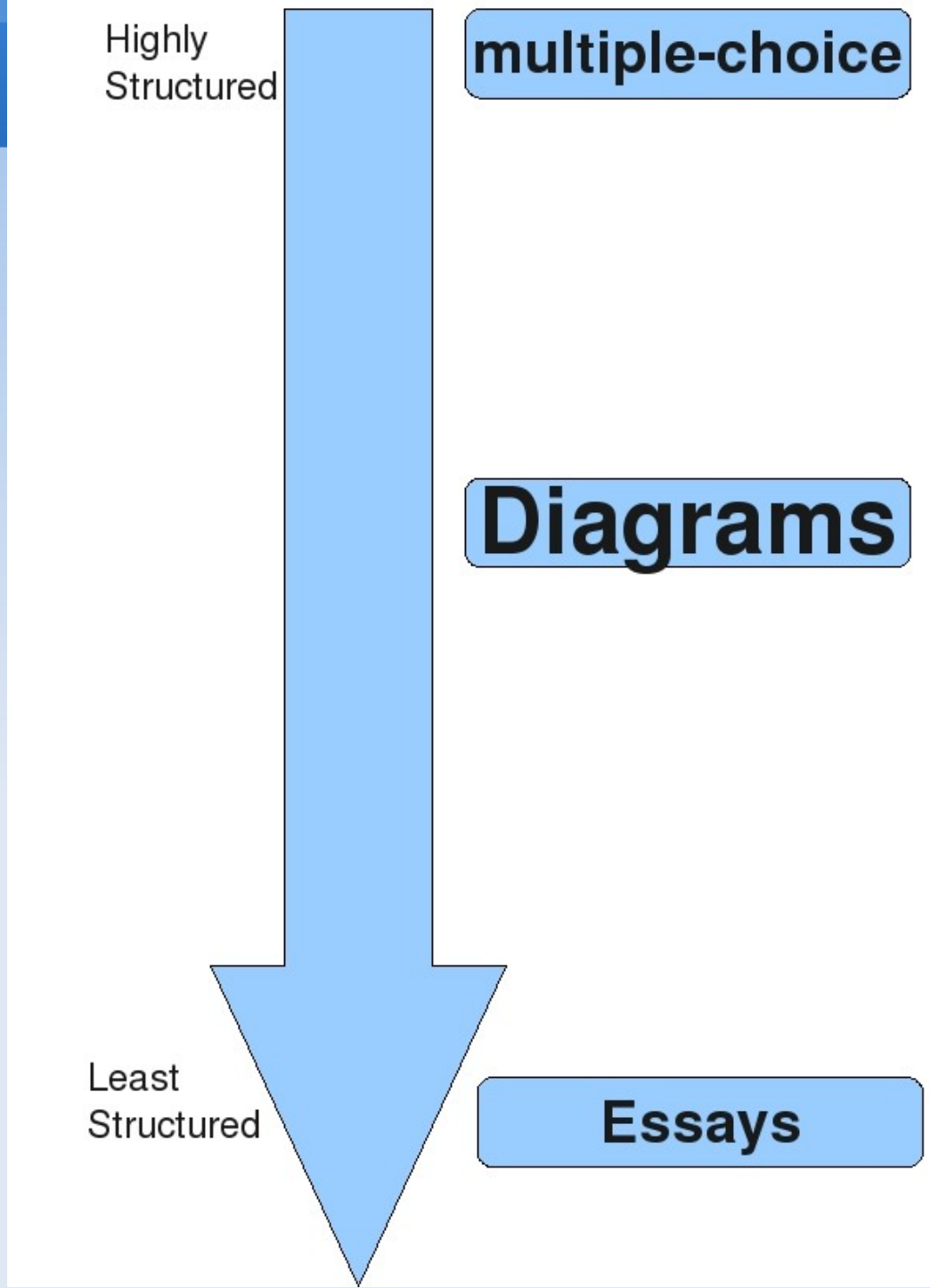
Myself

- Final year PhD Student at DISC,
- PhD Supervisor: Prof. Martin Shepperd

Project Aim

- Curriculum For Innovation Funded Project 2008/09
- Project Aim
  - To improve the undergraduate assessment by using automated marking.
- Benefits Of Automated Assessment
  - Timely feedback
  - Consistency of marking
  - Freeing up of valuable lecturer time

Types of coursework



Diagrams

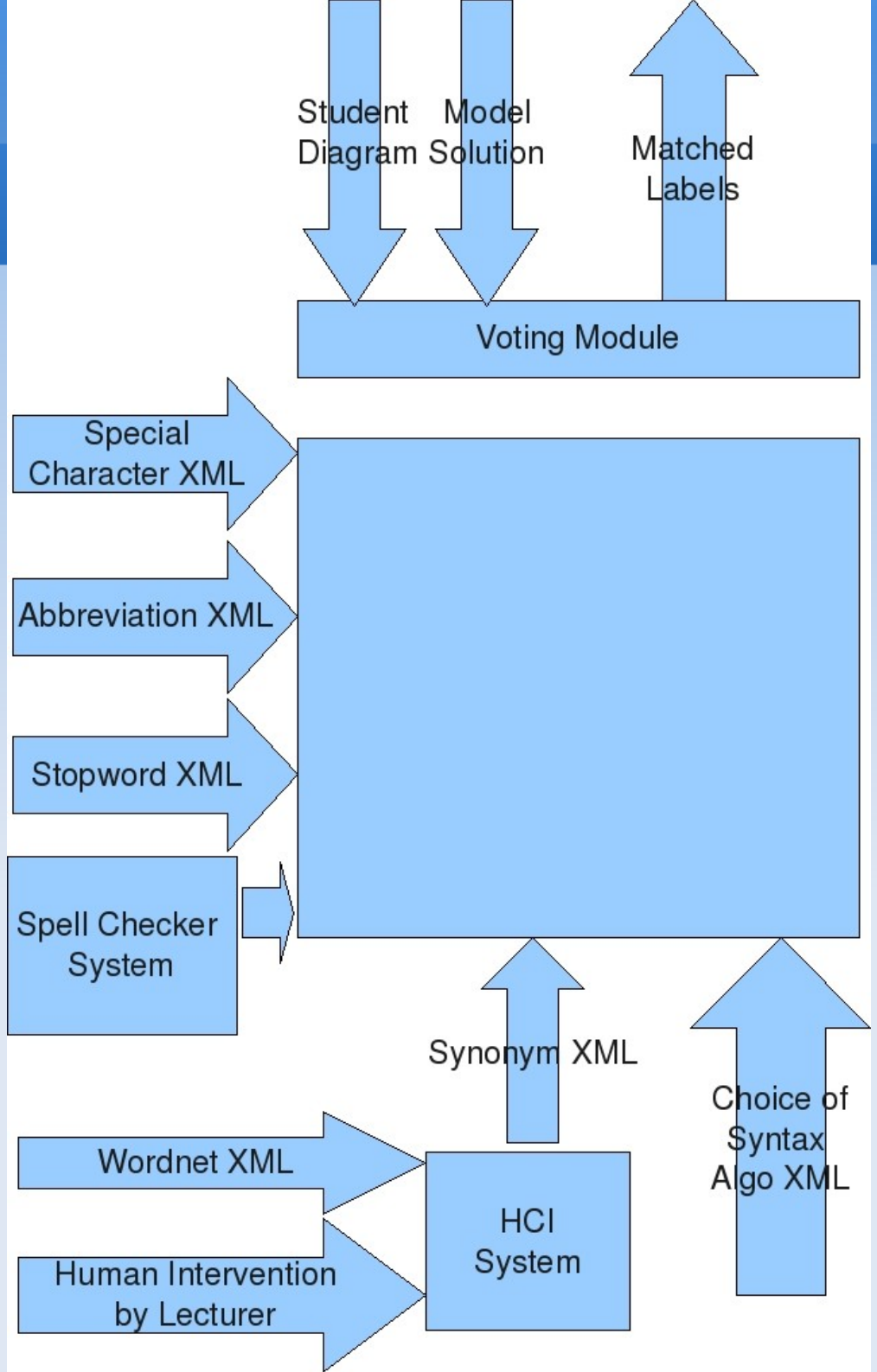
- Diagrams are often incomplete or are only partially correct but must still be assessed
- Labels:
  - Much of the meaning of a diagram resides in the labeling
- Synonyms:
  - Labels make use of natural language so there can be a proliferation of synonyms

Example of Difficult Labels

- Select Recipe:
  - select meal recipe
  - Select a recipe for their meal
  - must select a recipe for their meal
  - select receipe for meal (Spelling Mistake)
  - select recepe (Spelling Mistake)
  - choose meal

Project Objectives

- Develop the system as a demonstrator to semi-automate the marking process of diagrammatic coursework.
- Evaluate it on a coursework at Brunel.
- Package the results as a case on the web with software documentation.
- Develop a larger research proposal suitable for external funding


Student Diagram
Model Solution
Matched Labels
Voting Module
Special Character XML
Abbreviation XML
Stopword XML
Spell Checker System
Synonym XML
Choice of Syntax Algo XML
Wordnet XML
Human Intervention by Lecturer
HCI System

Assessment Tool

- **DiagramAssessmentTool.jar**
  - Customizable, Plug and Play, Extensible
- UMLDiagramXMIAPI.jar
    - Extracts labels from diagrams in XMI
- GenericLabelMatcher.jar
    - Matches Labels
- GenericLabelMatcherConcreteClasses.jar
- GenericLabelMatcherInterface.jar

HOW IT ALL WORKS

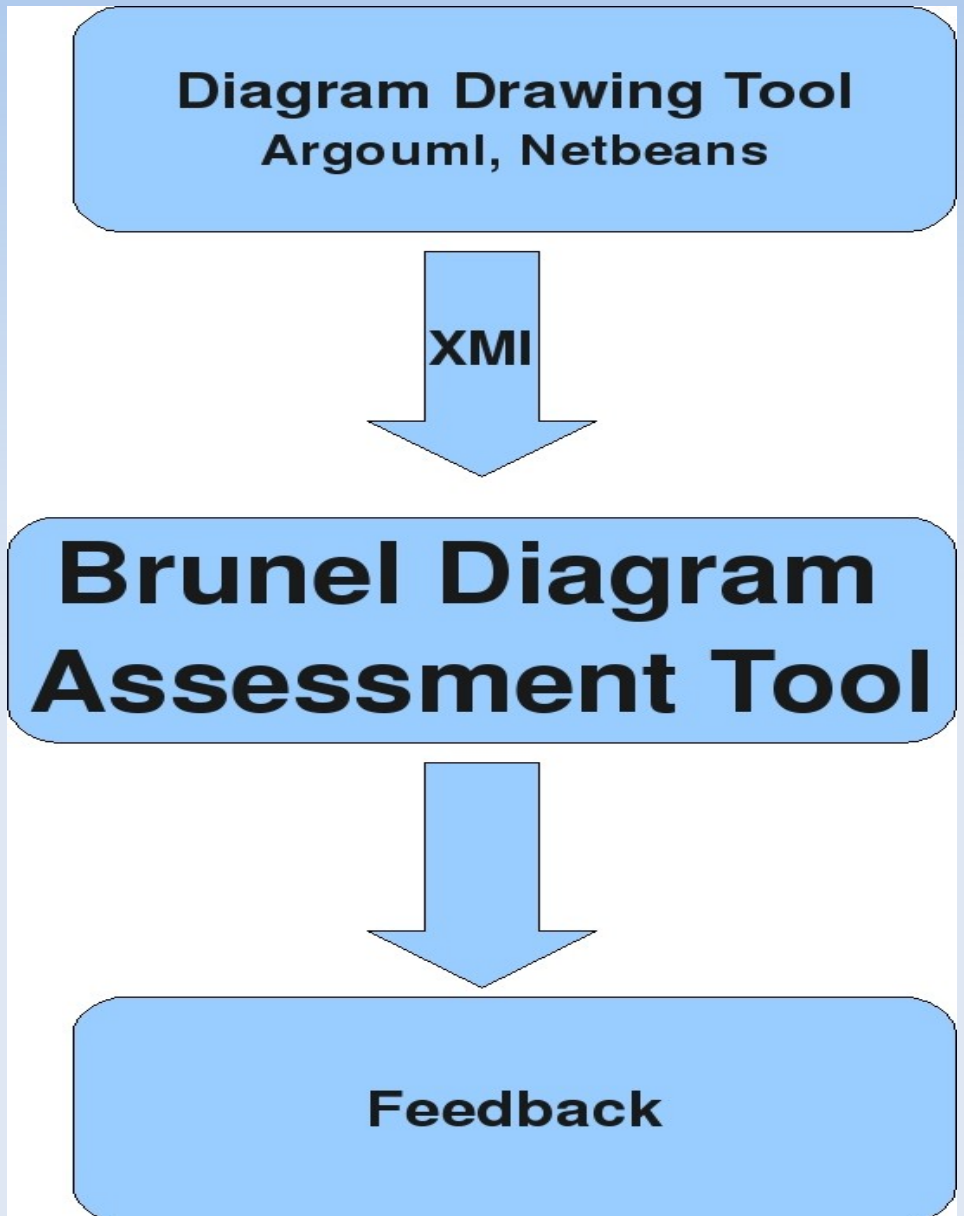
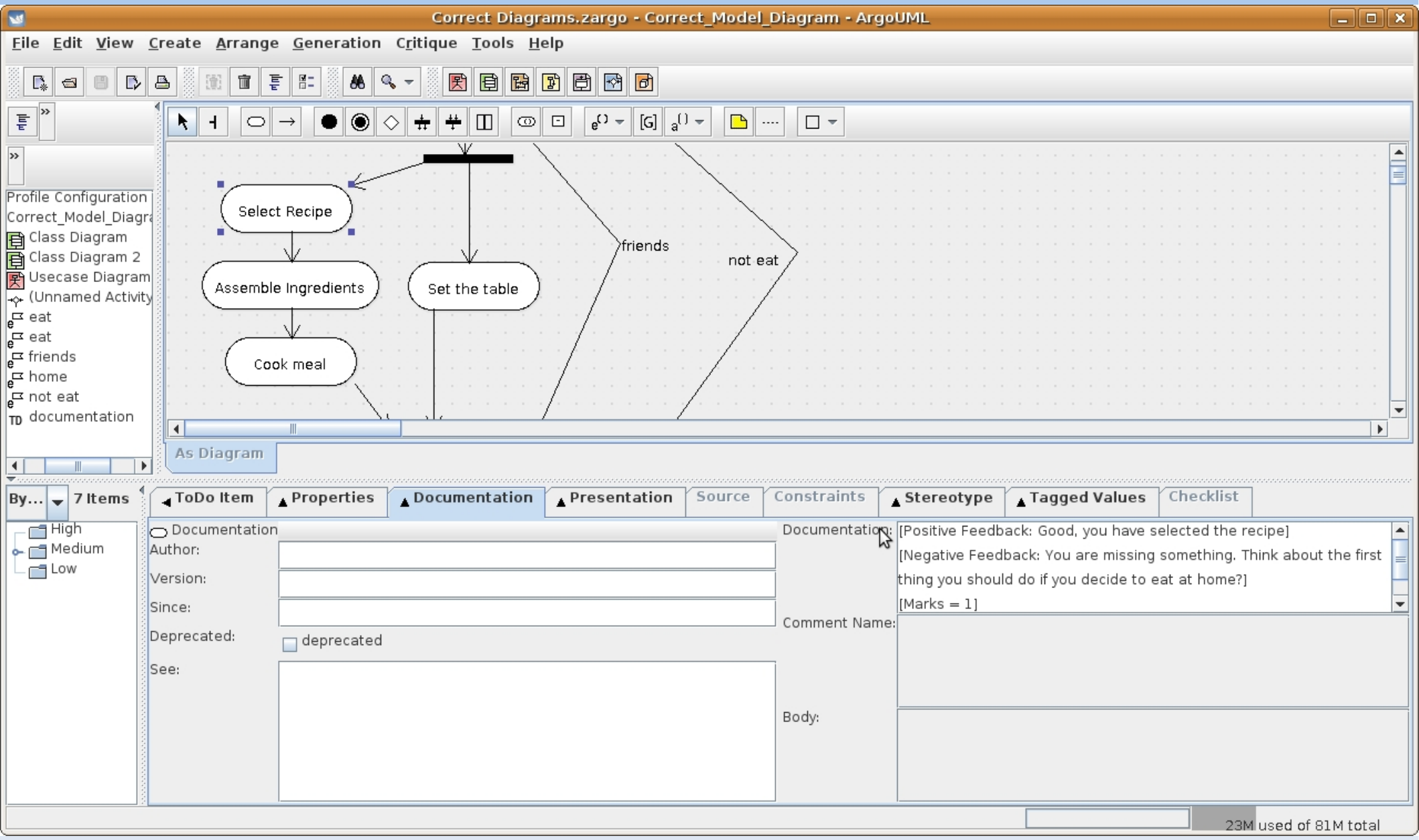


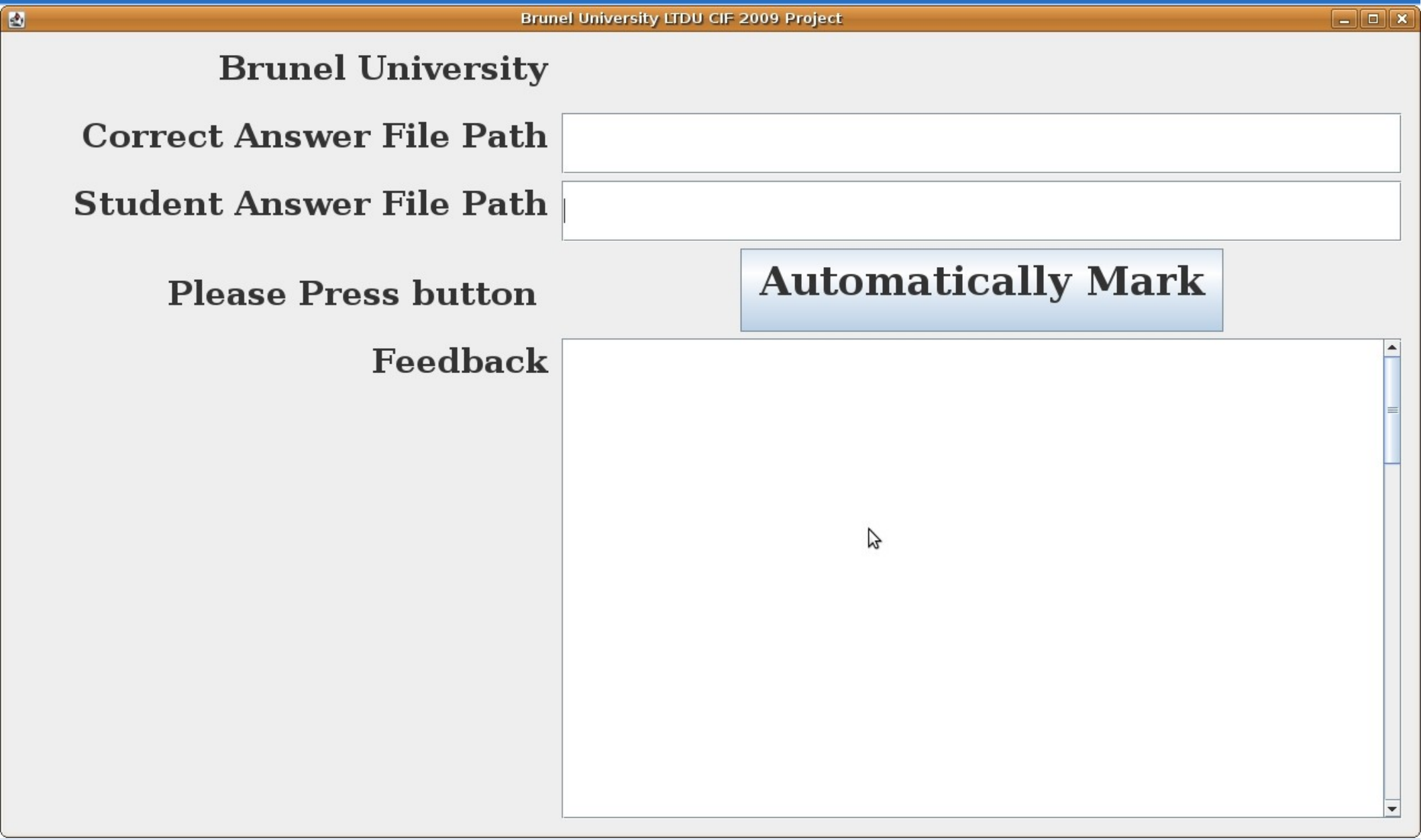
Diagram Drawing Tool Developed by University of California



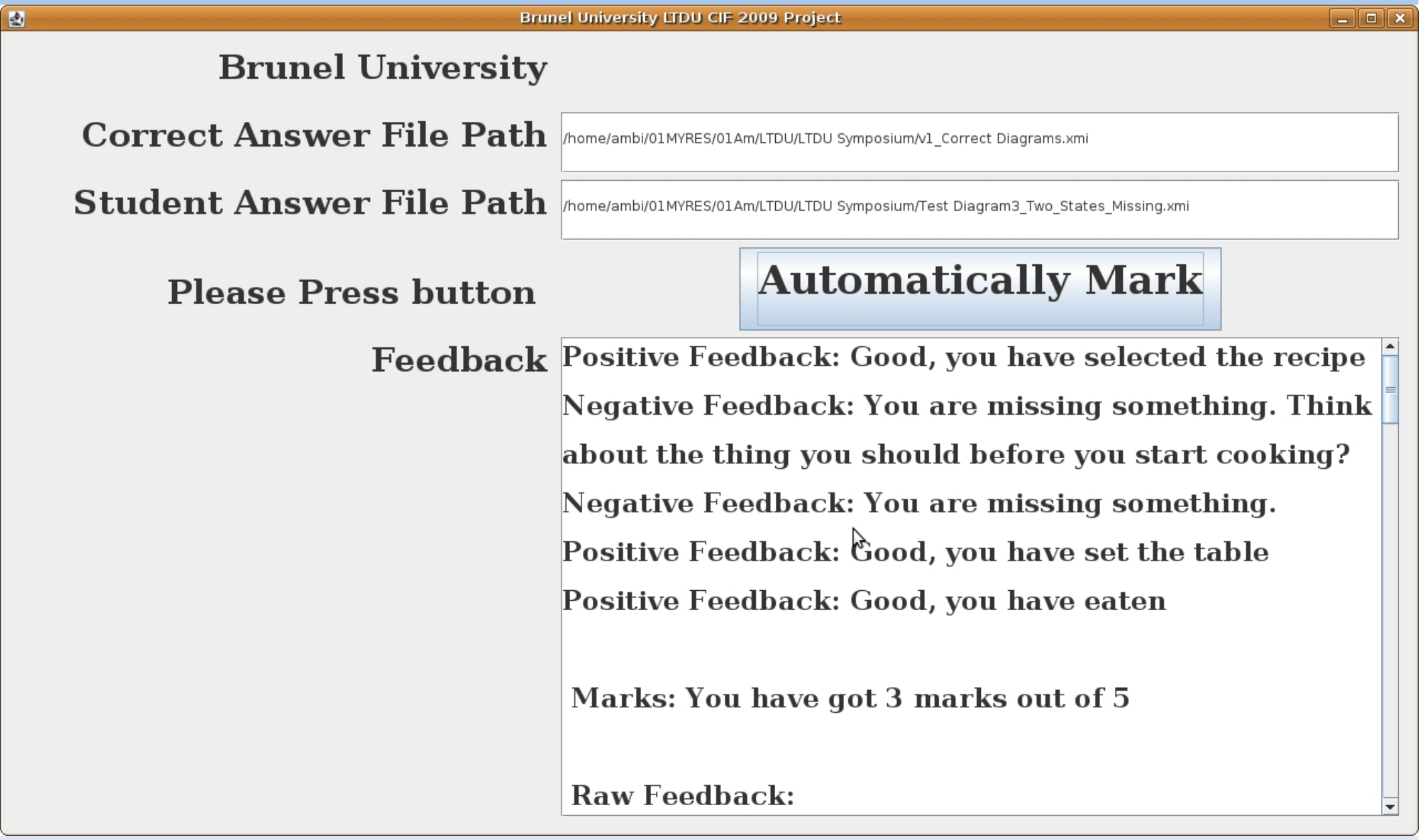
Feedback

- Correct Label: Select Recipe
- [Positive Feedback: Good, you have selected the recipe]
- [Negative Feedback: You are missing something. Think about the first thing you should do if you decide to eat at home?]
- [Marks = 1]
- [Order Index = 1]

Assessment Tool Developed By Brunel University



Assessment Tool Developed By Brunel University

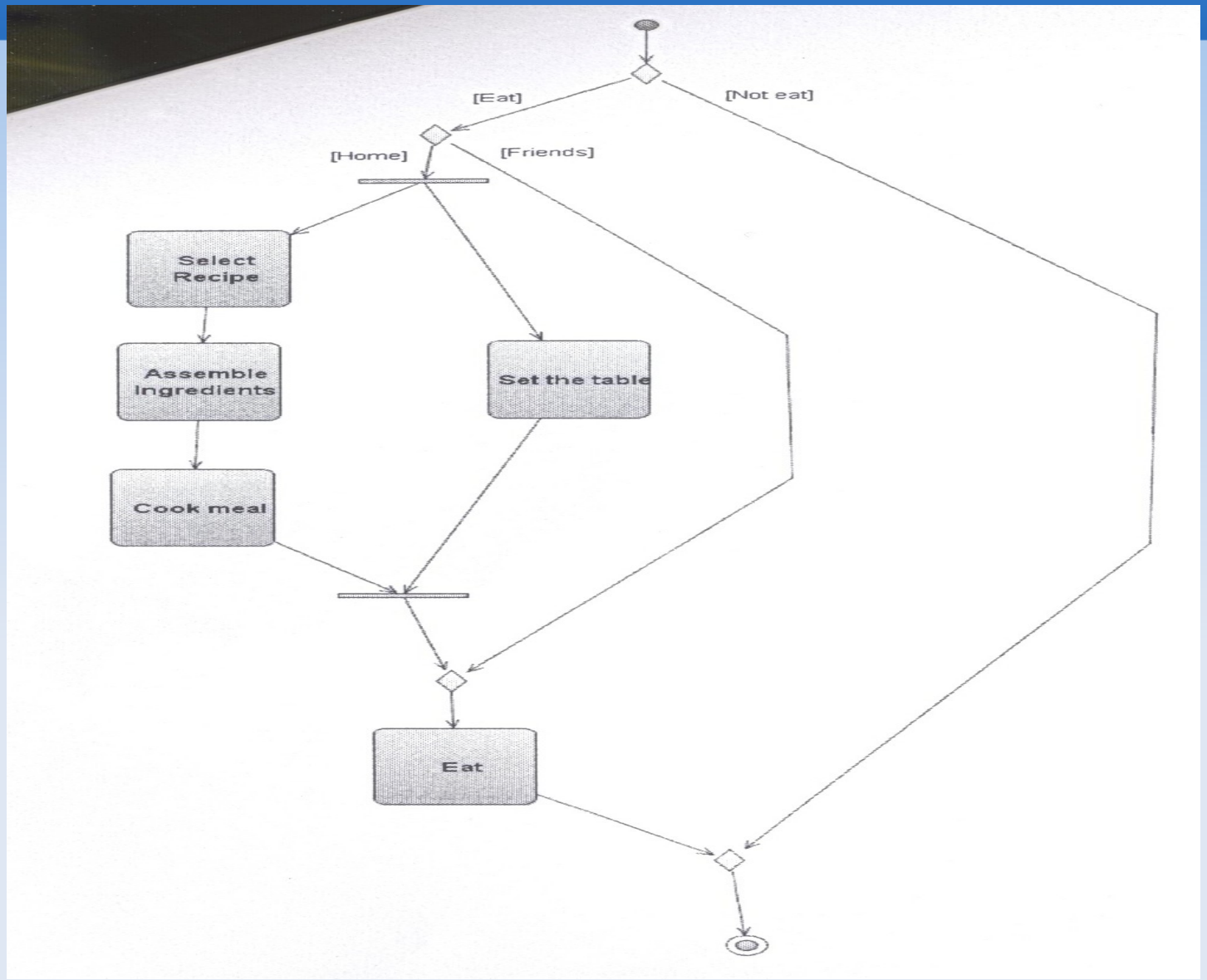


Evaluation

- Data Collection
  - Undergrad UML Module
  - Inclass paper based test
  - Paper scanned to JPEG images
  - Manually extracted labels.
  - 189 Students

- Question Text
  - Draw an Activity Diagram for the following simplified process of students eating an evening meal:
    - Students can either: not eat an evening meal, eat at a friend's house or cook some food at home. If a student eats at a friend's house they simply turn up at the arranged time and eat the meal produced by their friend. If a student eats at home they must select a recipe for their meal, assemble the ingredients, cook the meal, set the table then eat the meal.

Model Solution



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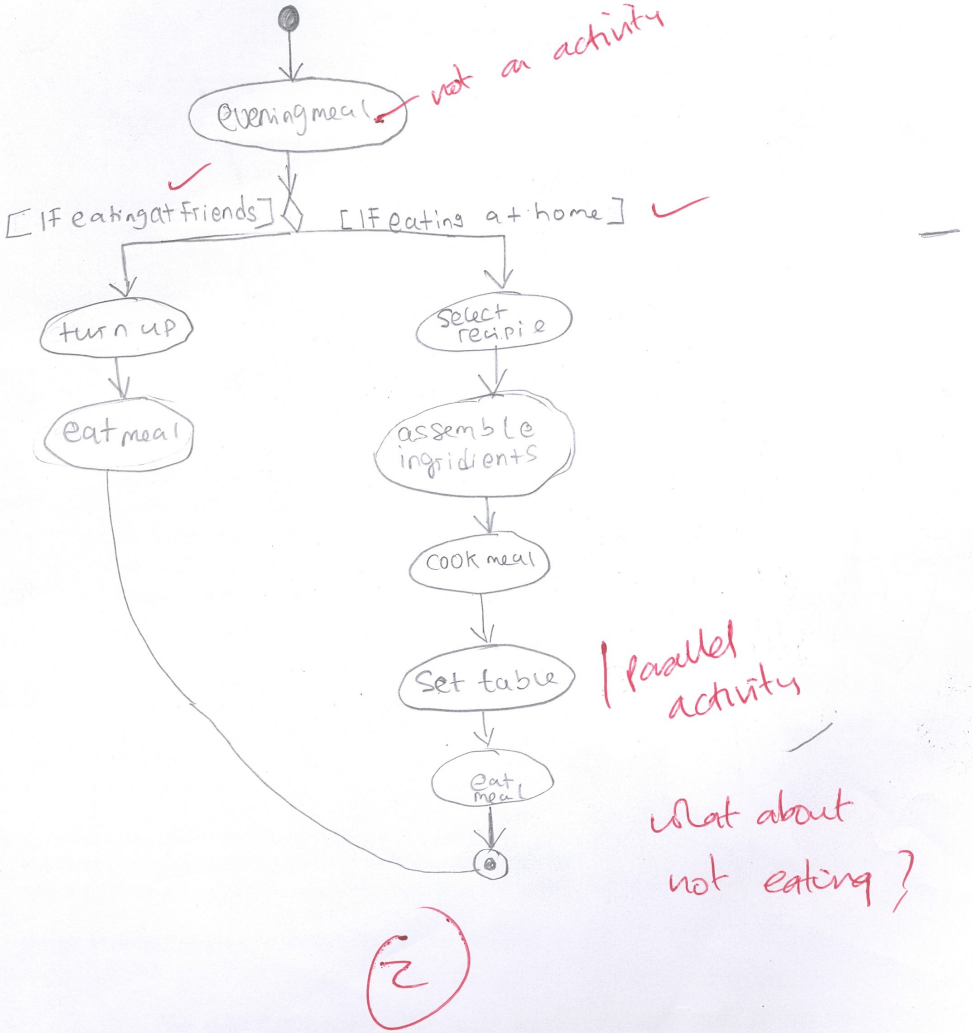
NSWER:



Results

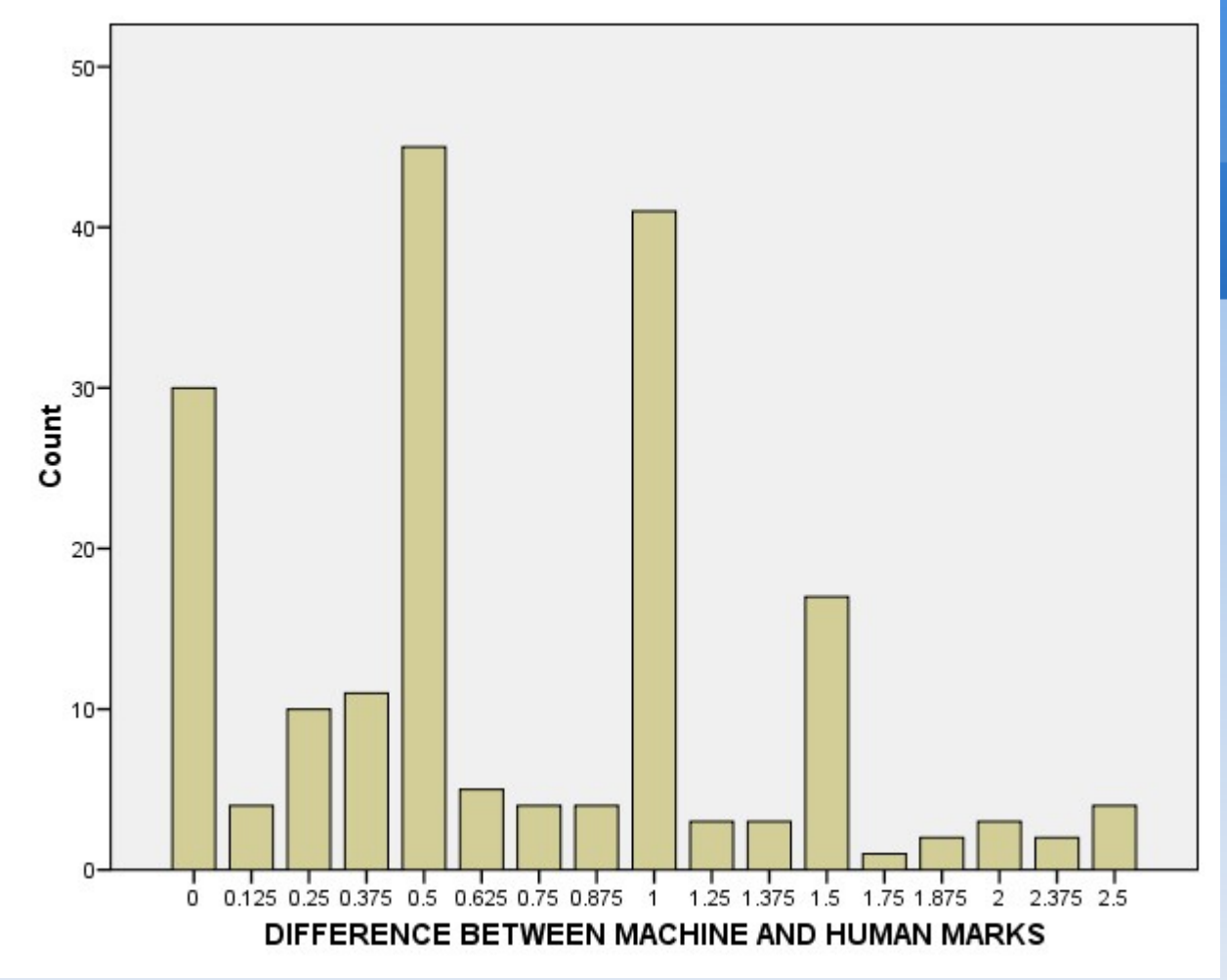
Statistics

		DIFFERENCE BETWEEN MACHINE AND HUMAN MARKS	MACHINE MARKS	HUMAN MARKS
N	Valid	189	189	189
	Missing	0	0	0
Mean		**.740079**	**3.163360**	**3.021164**
Median		.500000	2.500000	3.000000
Mode		.5000	2.5000	4.0000
Std. Deviation		**.5889757**	**1.3525796**	**.9422566**
Variance		.347	1.829	.888
Skewness		.906	-.151	-.303
Std. Error of Skewness		.177	.177	.177
Range		**2.5000**	**5.0000**	**5.0000**

Correlations

		MACHINE MARKS	HUMAN MARKS
MACHINE MARKS	Pearson Correlation	1	.722(**)
	Sig. (2-tailed)		.000
	N	189	189
HUMAN MARKS	Pearson Correlation	.722(**)	1
	Sig. (2-tailed)	.000	
	N	189	189

** Correlation is significant at the 0.01 level (2-tailed).



Frequency Table

DIFFERENCE BETWEEN MACHINE AND HUMA

		Frequency	Percent
Valid	.0000	30	15.9
	.1250	4	2.1
	.2500	10	5.3
	.3750	11	5.8
	.5000	45	23.8
	.6250	5	2.6
	.7500	4	2.1
	.8750	4	2.1
	1.0000	41	21.7
	1.2500	3	1.6
	1.3750	3	1.6
	1.5000	17	9.0
	1.7500	1	.5
	1.8750	2	1.1
	2.0000	3	1.6
	2.3750	2	1.1
	2.5000	4	2.1
	Total	189	100.0

External Funding and Publications

- Bid submitted to JISC (Rejected)
  - Feedback Summary: technically competent team of academics, but unfortunately the proposal was not in scope
- Bid submitted to HEA (under review)

- Jayal, A. and Shepperd, M. 2009. The Problem of Labels in E-Assessment of Diagrams. ACM J. Educ. Resour. Comput.
- Jayal, A. and Shepperd, M. (2009, Accepted). An improved method for label matching in e-assessment of diagrams. Electronic journal of the UK Higher Education Academy Subject Centre for Information and Computer Sciences (ICS)

Acknowledgements

- Dr. Kate Dunton Education Officer, LTDU
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- Selwyn Lloyd (Director, Phosphorix Limited)

- Discussion
- Thanks