DIVISION OF COMPUTER SCIENCE


A New Notation for Modelling Multimedia Systems with Three
Case Studies

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# A new notation for modelling multimedia systems with three case studies.

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## Introduction

This report is one of five which have been produced as a result of the Modelling MultiMedia (M3) ROPA project. The principal aim of M3 was to carry out a formal evaluation of a range of currently available modelling techniques in the light of their suitability for modelling highly interactive, multimedia systems used in education and training. The features of the systems which were of interest in the project are those that make modelling in the early stages of development particularly difficult: the incorporation of many different media, the high level of user participation and the role of the system in teaching, rather than simply informing, the user.

Findings from work on M3 indicate that a notation for modelling multimedia should:

- be able to illustrate the overall structure of the system with different routes through the information and interactions with the user;
- be able to illustrate the overall structure with indications of where the various media components fit in;
- be able to illustrate the overall structure, reflecting the different levels of details in the given requirements;
- be readily understandable by non computer scientists.

The original objectives of M3 focused on evaluation of existing modelling notations, rather than the development of new ones. However, towards the end of the project, we felt that we ought to attempt to implement our findings in a modelling notation and to test this on some small case studies. This report describes our initial experiments with a new notation.

In section 1 of this report we introduce the symbols of the new notation, together with some explanatory notes. Section 2 contains brief details of three case studies which were modelled using the notation and the initial models that were produced of each case study.

# Notation for modelling Multimedia systems
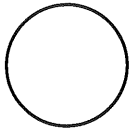
START
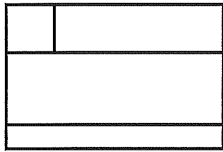
STATE NODE
1. Show the level and the state mode in the top LHS box
2. Show the enclosures in the bottom strip
video = v
sound = s
graphics = g
animation = a
buttons = b
text = t
menu = m

TRANSITION

n  SYSTEM ACTION REQUIIRING A CHOICE

+  TRANSITION WITH NO USER INPUT AND NO
   TIME DELAY
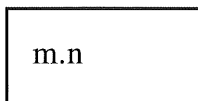
m.n  DESTINATION STATE NODE

| | |
|---|---|
| " t | t SECONDS |
| * | DECOMPOSES |
| \| | OR |

| | |
|---|---|
| cmvNAME | command video NAME |
| cmbNAME | command button NAME |
| cmtNAME | command text NAME |
| mnuNAME | menu option NAME |
| cmgNAME | command graphic NAME |

 Perpetual button number n

 Perpetual menu number n

 STATE NODE WITH INCORPORATED TIME ELEMENT

**Explanatory Notes**

START

The first symbol is an empty circle that indicated the start point of the diagram.

STATE NODE

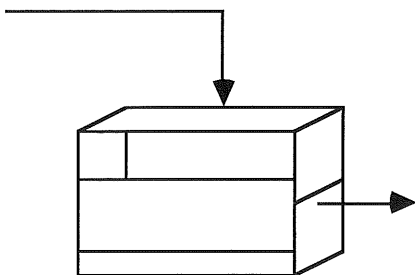Every individual screen has an identification number which is in the small box, in the top left hand corner of the screen box. This will help to identify the screen and the level at which it appears.

The long strip box at the bottom of the screen incorporates the media elements of the screen. This is particularly helpful at the primary design stages; it gives the developer an idea of the type of media involved and the number of screens which will use these media.

TRANSITION

A simple arrow represents the transition from one screen to another. The cause of the transition can be specified on the arrow, for example time, button pressed, etc.

SYSTEM ACTION REQUIRING A CHOICE

The selection by user is identified and numbered for reference purposes.

DESTINATION STATE NODE

The result of an action's destination is presented with its identification address in a rectangular box.

"t

This symbol normally appears on the transition arrow. It indicates the waiting time required for the transition to occur.

\*

This symbol appears on the top right hand corner of the screen box, it indicates that this screen is decomposed to lower levels.

|    (OR)

This is used as logical or. The | symbol is used to separate alternative actions.

cmvNAME

cmbNAME

cmtNAME

cmgNAME

mnuNAME

These are included on the transition arrow in order to indicate which action causes the system transition.

## PERPETUAL BUTTON NUMBER n

The perpetual button symbol is used when a generic button appears on all/some screens and produces the same effect in each case; for example an exit button which appears on all screens and when activated takes the user out of the system is a perpetual button. Similarly, a perpetual menu is a generic menu on all/some screens; one example is an exit option designed as a menu.

## STATE TRANSITION NODE WITH INCORPORATED TIME ELEMENT

One of the important elements of multimedia is management of time. This is not included in the STATE NODE (see above). For the sake of completion we introduce a new symbol to incorporate time. It may be the case that for one particular design it is not used at all, but it is a facility available which adds to the robustness of the notation.

The top arrow indicates from where (in time) a particular type of media begins and the side arrow indicates whether the media can be stopped half way or whether the user will have to wait for the media to finish. The media could be sound, video or animation.

# MAISIE

## Multimedia AntI-Smoking In Education

MAISIE is part of a research project concerned with the use of multimedia in health promotion, in particular as part of a smoking prevention campaign.

The overall aim of the MAISIE system is to reduce the prevalence of smoking by promoting a lasting resistance to smoking in children aged 7 - 9 years.

The objectives contributing to the overall aim are:

- to increase awareness and knowledge in children aged 7 - 9 years of the risks and effects of smoking;
- to modify attitudes to smoking and smokers in these children;
- to teach skills that enable children to resist pressures to smoke.


The MAISIE system takes four approaches to smoking prevention:

- smoking facts: presenting simple facts and myths about various aspects of smoking
- interview with a smoker: a chance for children to role-play smokers and their friends
- interactive story: to help children develop the skills to cope with problematic situations related to smoking
- quiz: to test the children's understanding and retention of material presented

```
┌─────┬─────────┐
│ 0   │       * │
├─────┴─────────┤
│ MAISIE        │
├───────────────┤
│ a,g,v,s,b     │
└───────────────┘
```

# CONTEXT DIAGRAM

```
          ┌──────────────┐                      ┌──────────────┐                      ┌──────────────┐
 ╭─────╮  │ 1 │          │   cmbCONTINUE|"30    │ 2 │          │   cmbCONTINUE|"30    │ 3 │        * │
(START )─▶│───┴──────────│─────────────────────▶│───┴──────────│─────────────────────▶│───┴──────────│
 ╰─────╯  │ MAISIE       │                      │ NO  SMOKING  │                      │ MAIN MENU    │
          │ PROTOTYPE    │                      │ SIGN         │                      │              │
          ├──────────────┤                      ├──────────────┤                      ├──────────────┤
          │ g,s,b        │                      │ g,s,b        │                      │ g,s,b        │
          └──────────────┘                      └──────────────┘                      └──────────────┘
```

# LEVEL ONE

# MAIN MENU 3

| 3.1 | * |
|---|---|
| FACTS MENU | |
| a,g,b | |

cmbFACTS

| 3.2 | * |
|---|---|
| INTERVIEW SELECTION | |
| a,g,b | |

cmbINTERVIEW

| 3.3 | * |
|---|---|
| STORY | |
| a,g,b | |

cmbSTORY

| 3.4 | * |
|---|---|
| QUIZ | |
| a,g,b | |

cmbQUIZ

cmbQUIT

EXIT

## LEVEL TWO

# FACTS  3.1



cmbSMOKING MYTHS → 3.1.1

cmbTHE SMOKERS FATE → 3.1.2

cmbYOUR HEALTH → 3.1.3

cmbTHE COSTS → 3.1.4

cmvASHTRAY → 3.1.5

cmvGOBACK → 3
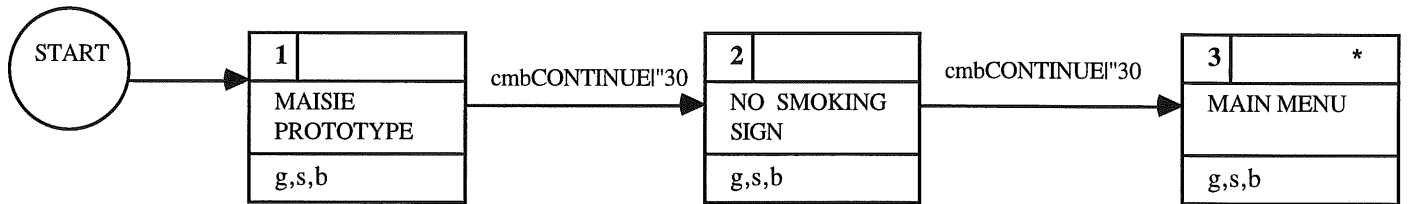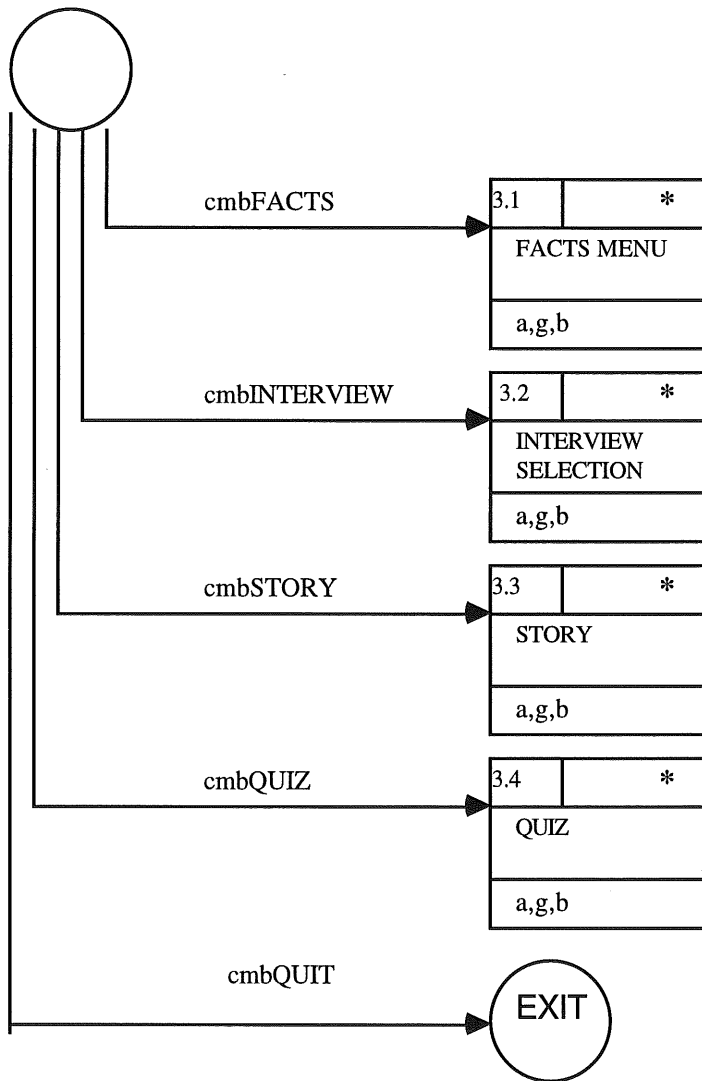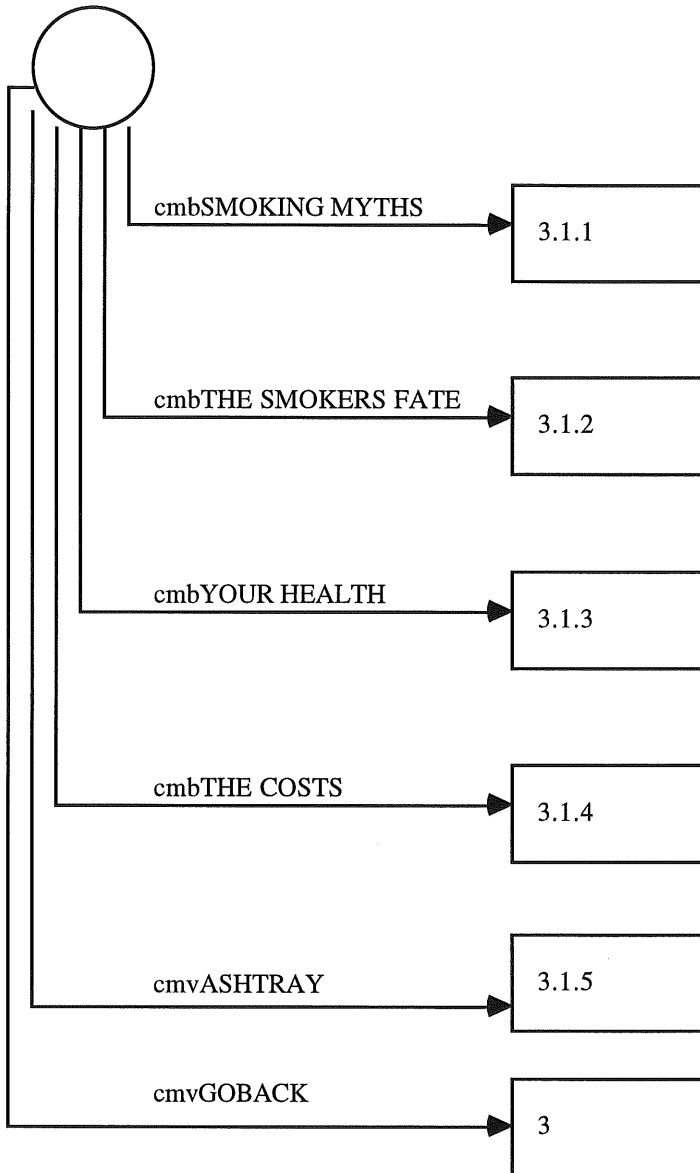
# LEVEL THREE

# INTERVIEW 3.2

cmbJANE

| 3.2.1 | * |
|-------|---|
| Jane+Questions | |
| a,g,s,b | |

3.2.5

cmbSPIKE

| 3.2.2 | * |
|-------|---|
| Spike+Question | |
| a,g,,s,b | |

3.2.6

cmbMARTIN

| 3.2.3 | * |
|-------|---|
| Martin+Ques. | |
| a,g,s,b | |

3.2.7

cmbKATHY

| 3.2.4 | * |
|-------|---|
| Kathy+Ques. | |
| a,g,s,b | |

3.2.8

cmbGOBACK

3.2

# LEVEL THREE

# STORY 3.3

| 3.3.1 | |
|---|---|
| picture 1 | |
| a,g, | |

CONTIUE|"30

| 3.3.2 | |
|---|---|
| picture 2 | |
| a,g, | |

CONTIUEl"30

| 3.3.3 | |
|---|---|
| picture 3 | |
| a,g, | |

CONTIUEl"30

| 3.3.4 | |
|---|---|
| QUESTION+ picture 4 | |
| g,b | |

| 3.3.5 |
|---|
| |

# LEVEL THREE

# QUIZ 3.4

| | |
|---|---|
| 3.4.1 | |
| Question 1 | |
| a,g, | |

cmbANSWER

| |
|---|
| 3.4.5 |

+

| | |
|---|---|
| 3.4.2 | |
| Question 2 | |
| a,g, | |

cmbANSWER

| |
|---|
| 3.4.5 |

+

| | |
|---|---|
| 3.4.3 | |
| Question 3 | |
| a,g, | |

cmbANSWER

| |
|---|
| 3.4..5 |

+

| | |
|---|---|
| 3.4.4 | |
| Question 4 | |
| a,g, | |

cmbANSWER

| |
|---|
| 3.4.5 |
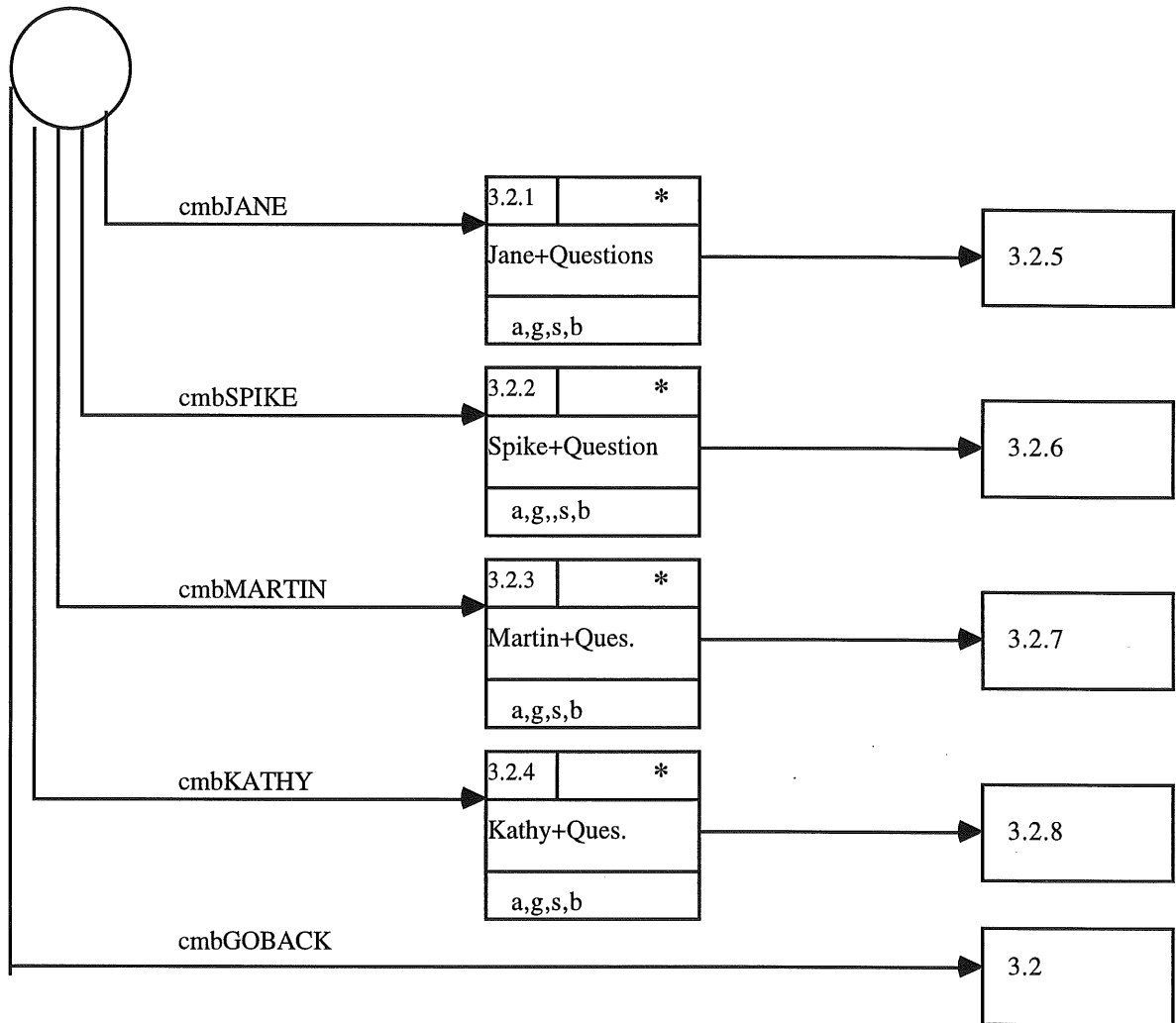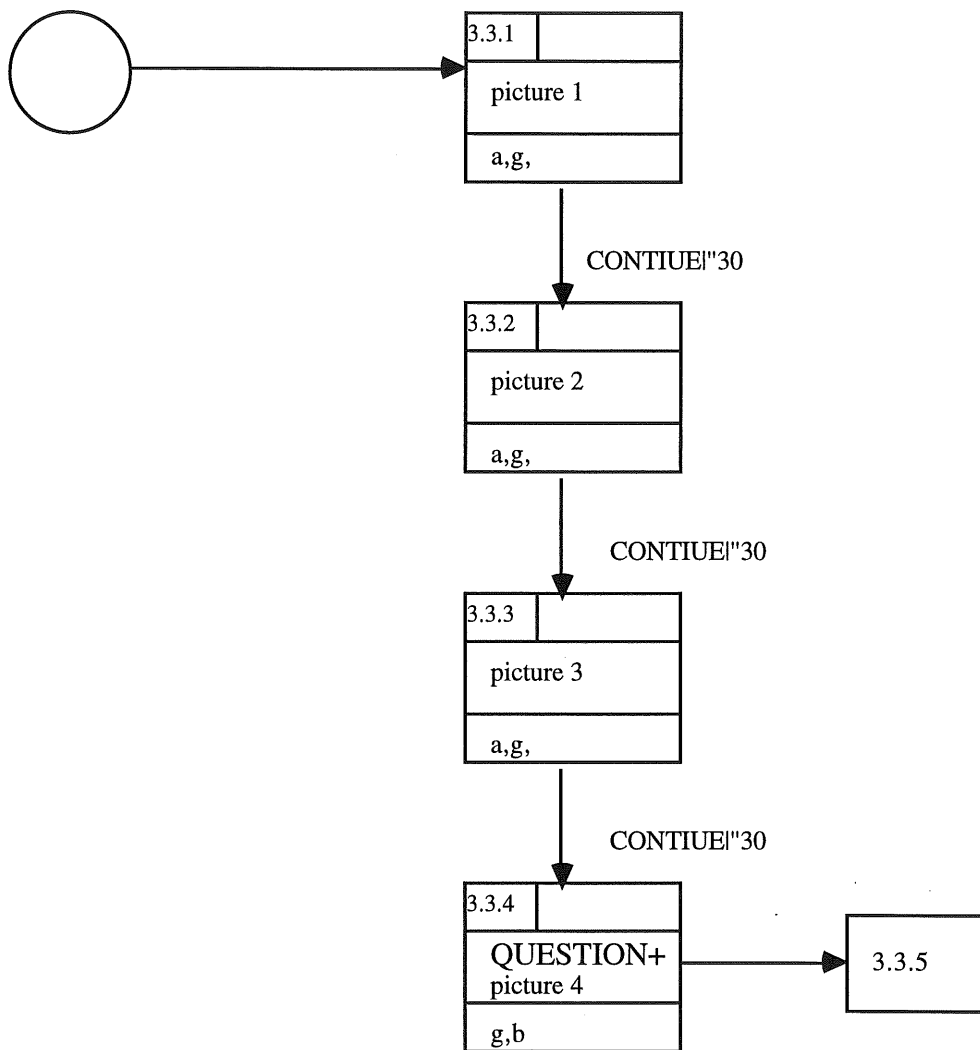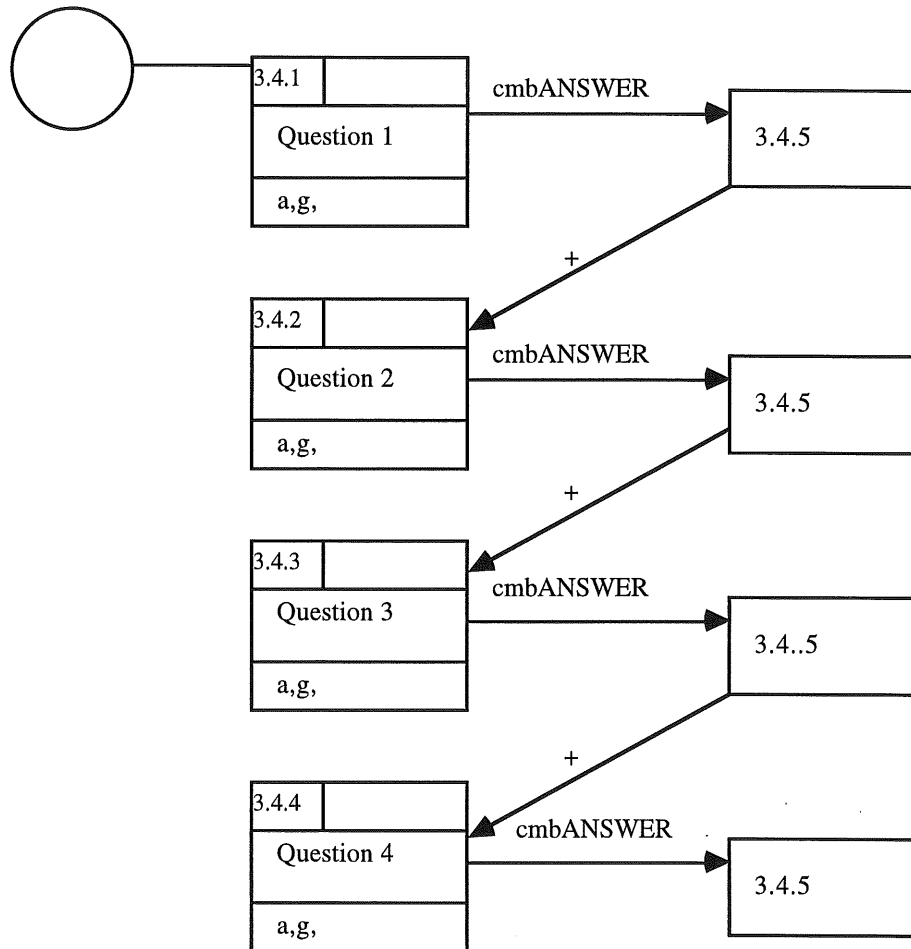
## LEVEL THREE

# YOUR  HEALTH  3.1.3

cmgYourHealt

| 3.13.1 | |
|---|---|
| The Human Body | |
| g | |

"30

| 3.1.3.2 | * |
|---|---|
| Heart/Lung | |
| g | |

cmbGOBACK

| 3.1 |
|---|
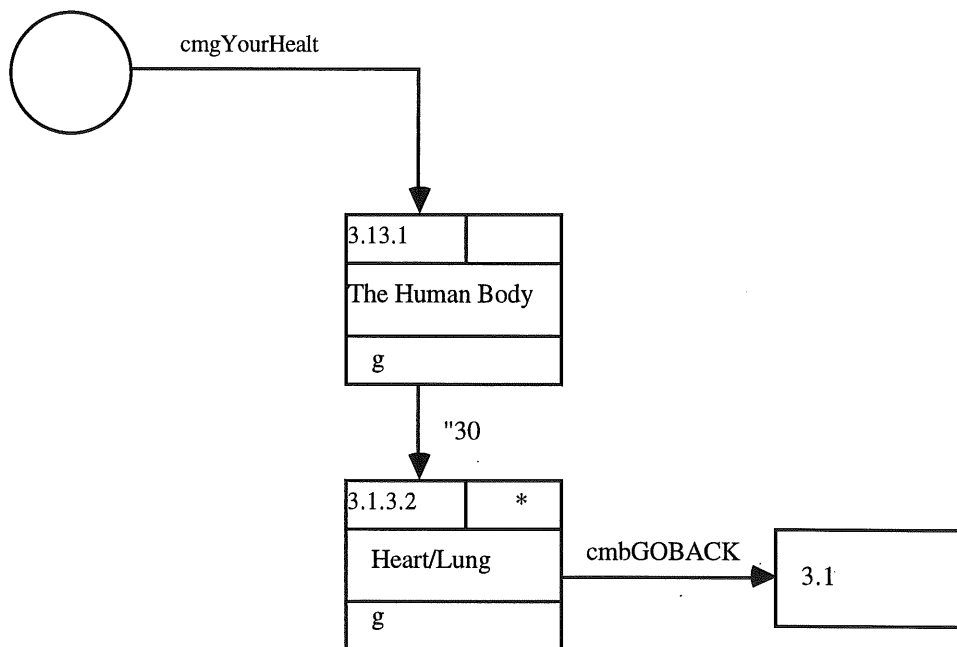
# LEVEL FOUR

# JANE+QUESTION 3.2.5

cmbQUESTION1

| 3.2.5.1 | |
|---|---|
| Jane's Answer 1 | |
| a,g | |

cmbQUESTION2

| 3.2.5.2 | |
|---|---|
| Jane's Answer 2 | |
| a,g | |

cmbQUESTION3

| 3.2.5.3 | |
|---|---|
| Jane's Answer 3 | |
| a,g | |

cmbQUESTION4

| 3.2.5.4 | |
|---|---|
| Jane's Answer 4 | |
| a,g | |

cmbQUESTION5

| 3.2.5.5 | |
|---|---|
| Jane's Answer 5 | |
| a,g | |

3.2.1
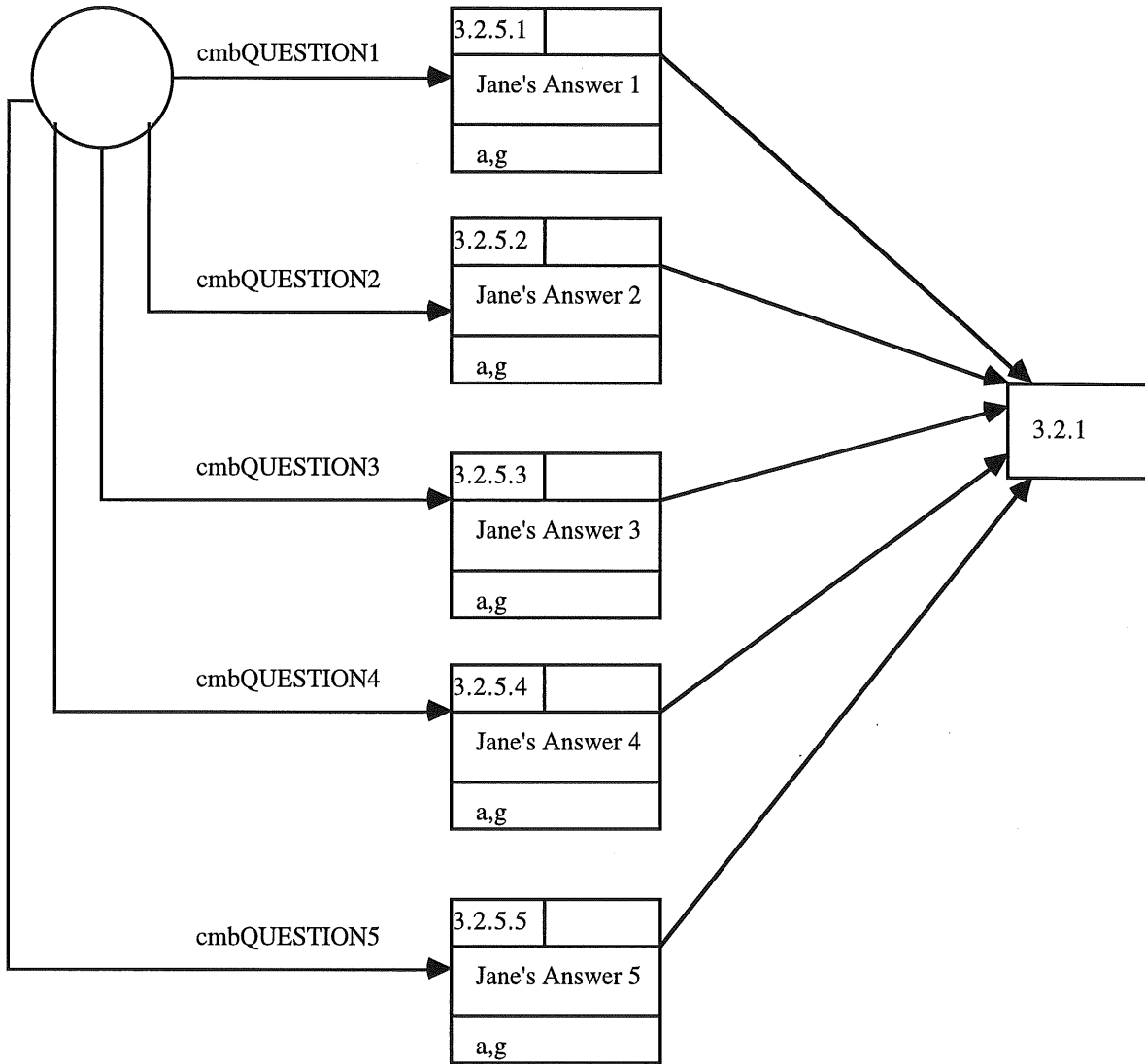
# LEVEL FOUR

# SPIKE+QUESTION 3.2.6



| cmbQUESTION1 | 3.2.6.1 | |
| | Spike's Answer 1 | |
| | a,g | |

| cmbQUESTION2 | 3.2.6.2 | |
| | Spike's Answer 2 | |
| | a,g | |

| cmbQUESTION3 | 3.2.6.3 | |
| | Spike's Answer 3 | |
| | a,g | |

| cmbQUESTION4 | 3.2.6.4 | |
| | Spike's Answer 4 | |
| | a,g | |

| cmbQUESTION5 | 1.3.2.6.5 | |
| | Spike's Answer 5 | |
| | a,g | |

3.2.1
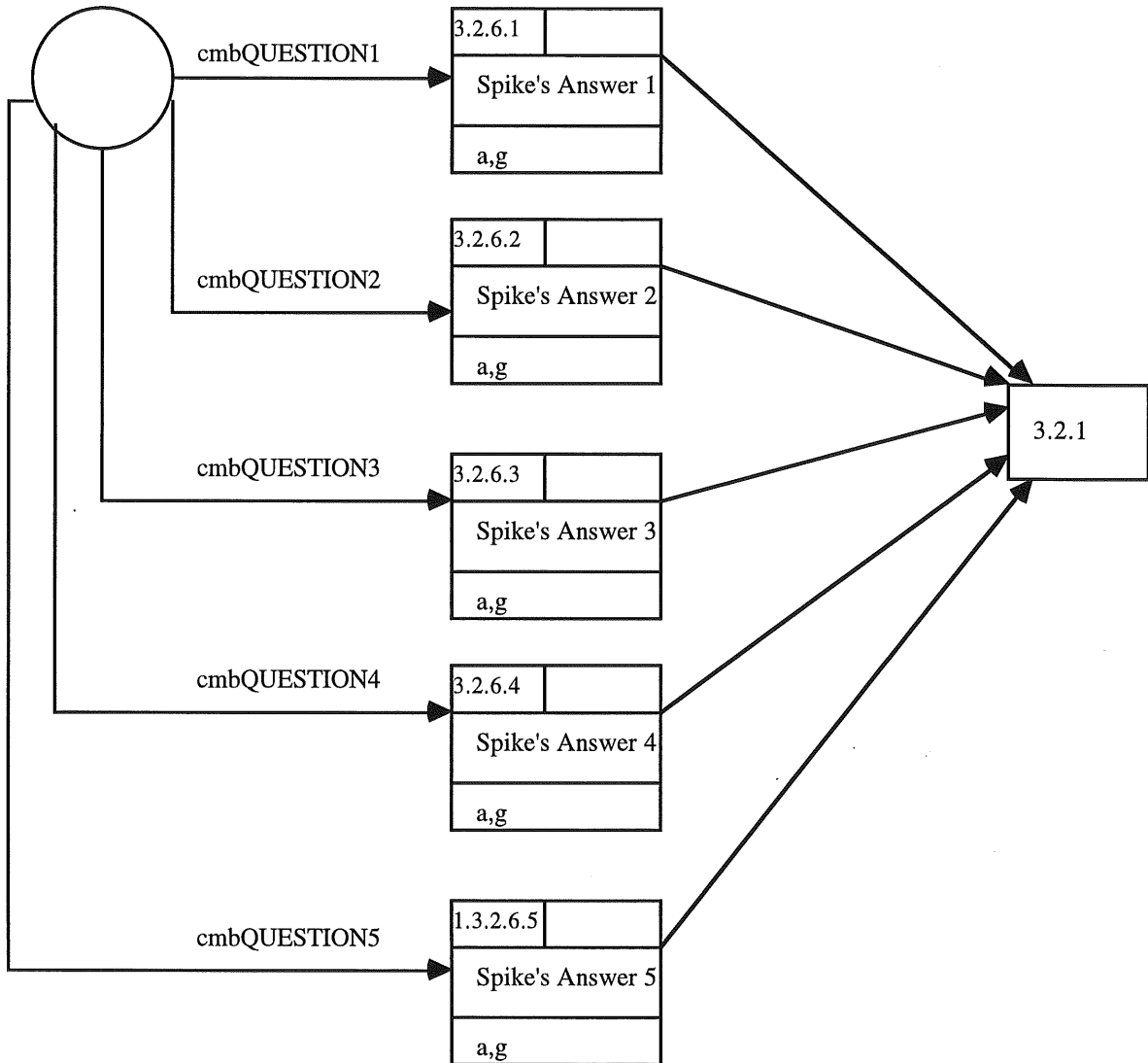
# LEVEL FOUR

# MARTIN+QUESTION 3.2.7

| 3.2.7.1 | |
|---|---|
| Martin's Answer 1 | |
| a,g | |

cmbQUESTION1

| 3.2.7.2 | |
|---|---|
| Martin's Answer 2 | |
| a,g | |

cmbQUESTION2

| 3.2.7.3 | |
|---|---|
| Martin's Answer 3 | |
| a,g | |

cmbQUESTION3

| 3.2.7.4 | |
|---|---|
| Martin's Answer 4 | |
| a,g | |

cmbQUESTION4

| 3.2.7.5 | |
|---|---|
| Martin's Answer 5 | |
| a,g | |

cmbQUESTION5

3.2.1
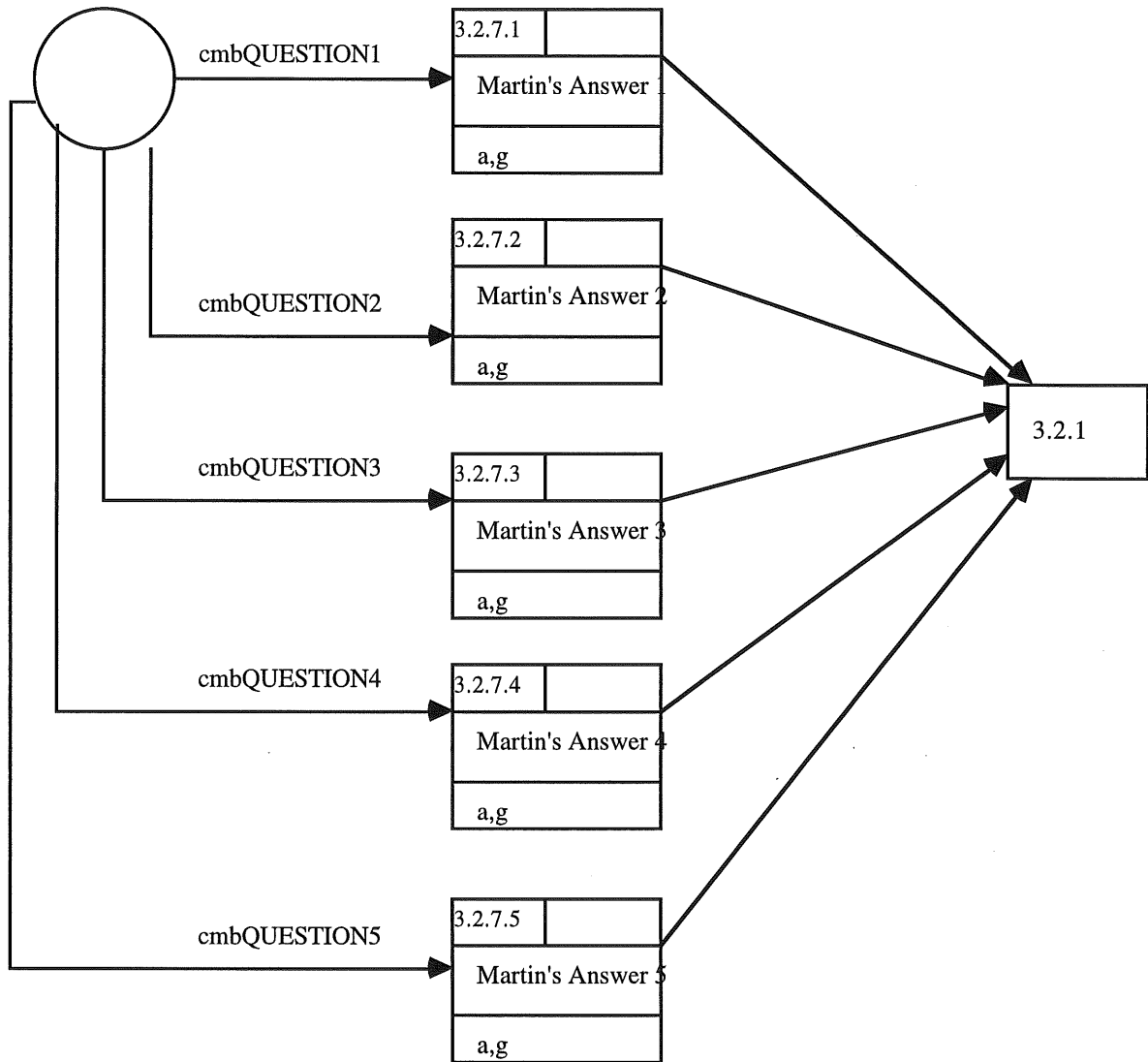
# LEVEL FOUR

# KATHY+QUESTION 3.2.8

cmbQUESTION1

| 3.2.8.1 | |
|---|---|
| Kathy's Answer 1 | |
| a,g | |

cmbQUESTION2

| 3.2.8.2 | |
|---|---|
| Kathy's Answer 2 | |
| a,g | |

cmbQUESTION3

| 3.2.8.3 | |
|---|---|
| Kathy's Answer 3 | |
| a,g | |

cmbQUESTION4

| 3.2.8.4 | |
|---|---|
| Kathy's Answer 4 | |
| a,g | |

cmbQUESTION5

| 3.2.8.5 | |
|---|---|
| Kathy's Answer 5 | |
| a,g | |

3.2.1

## LEVEL FOUR

# STORY  3.3.5

| 3.3.5.1 | |
|---|---|
| picture 1 | |
| g,b | |

cmbYES

| | |
|---|---|
| 3 | |

| 3.3.5.2 | |
|---|---|
| picture 2 | |
| g,b | |

cmbNO

| | |
|---|---|
| 3 | |

## LEVEL FOUR

# QUIZ 3.4.5

cmb WRONG

| 3.4.1 | |
|-------|---|
| SORRY | |
| a,g, | |

cmbCORRECT

| 3.4.1 | |
|-------|---|
| WELLDONE | |
| a,g, | |
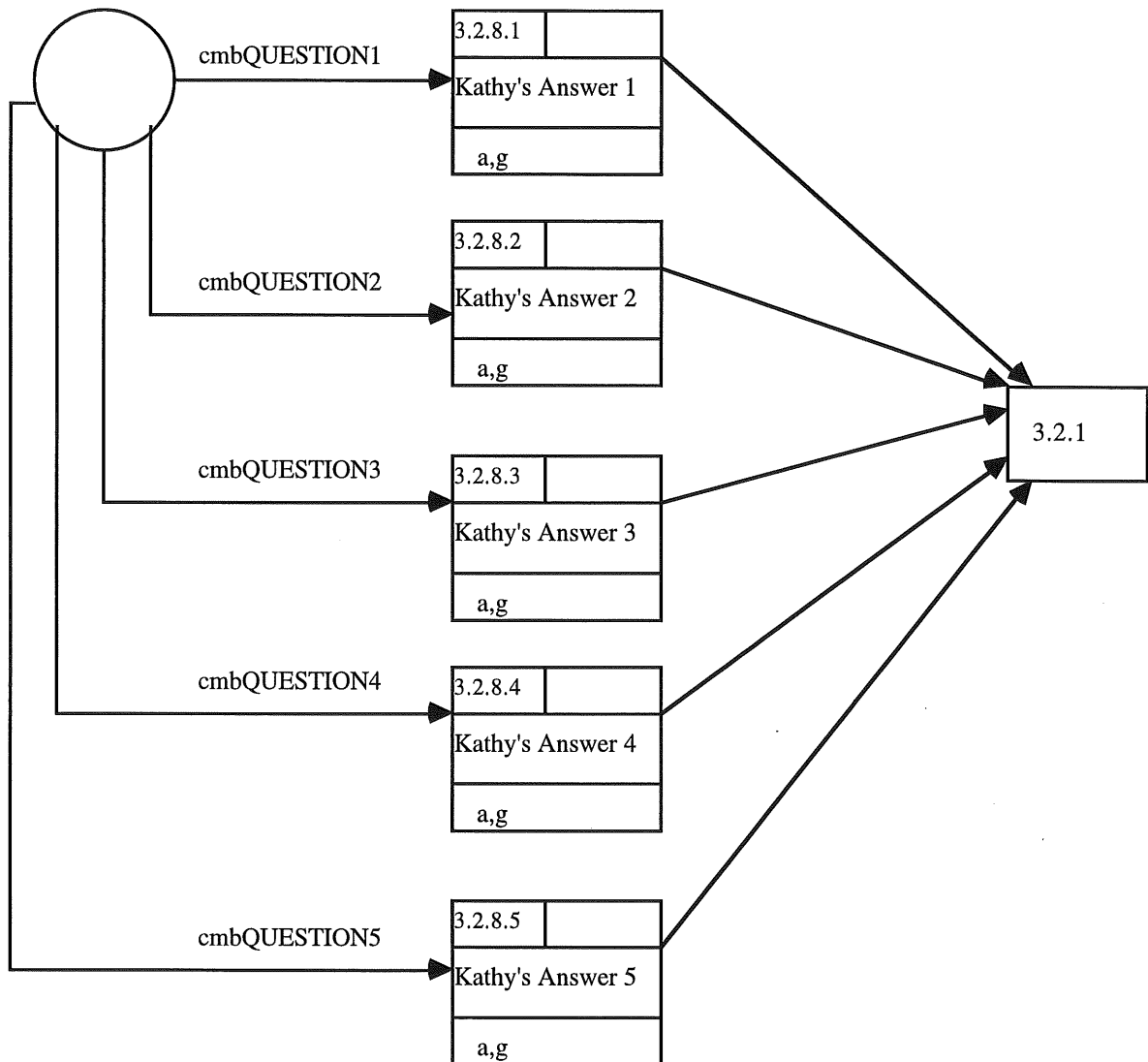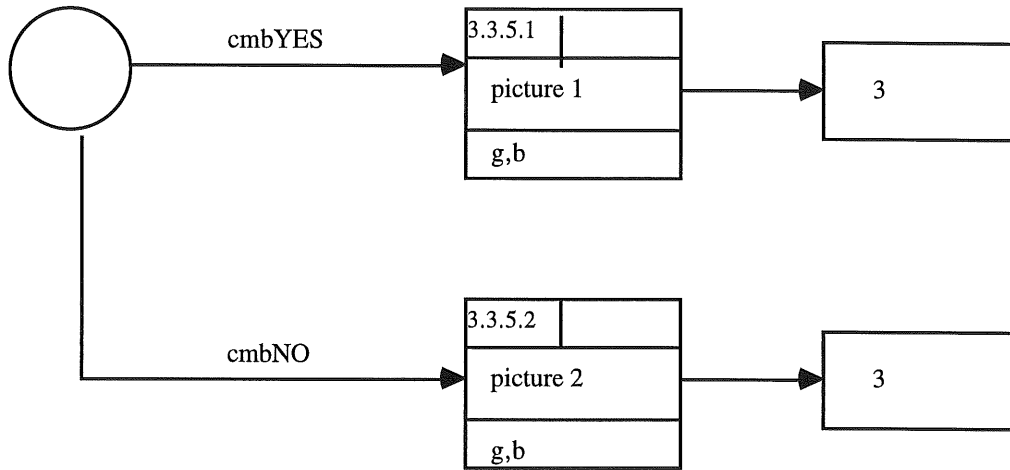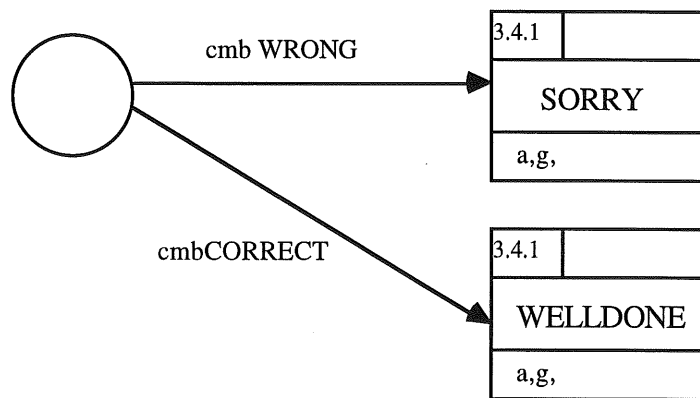
# LEVEL FOUR

# REFUGE

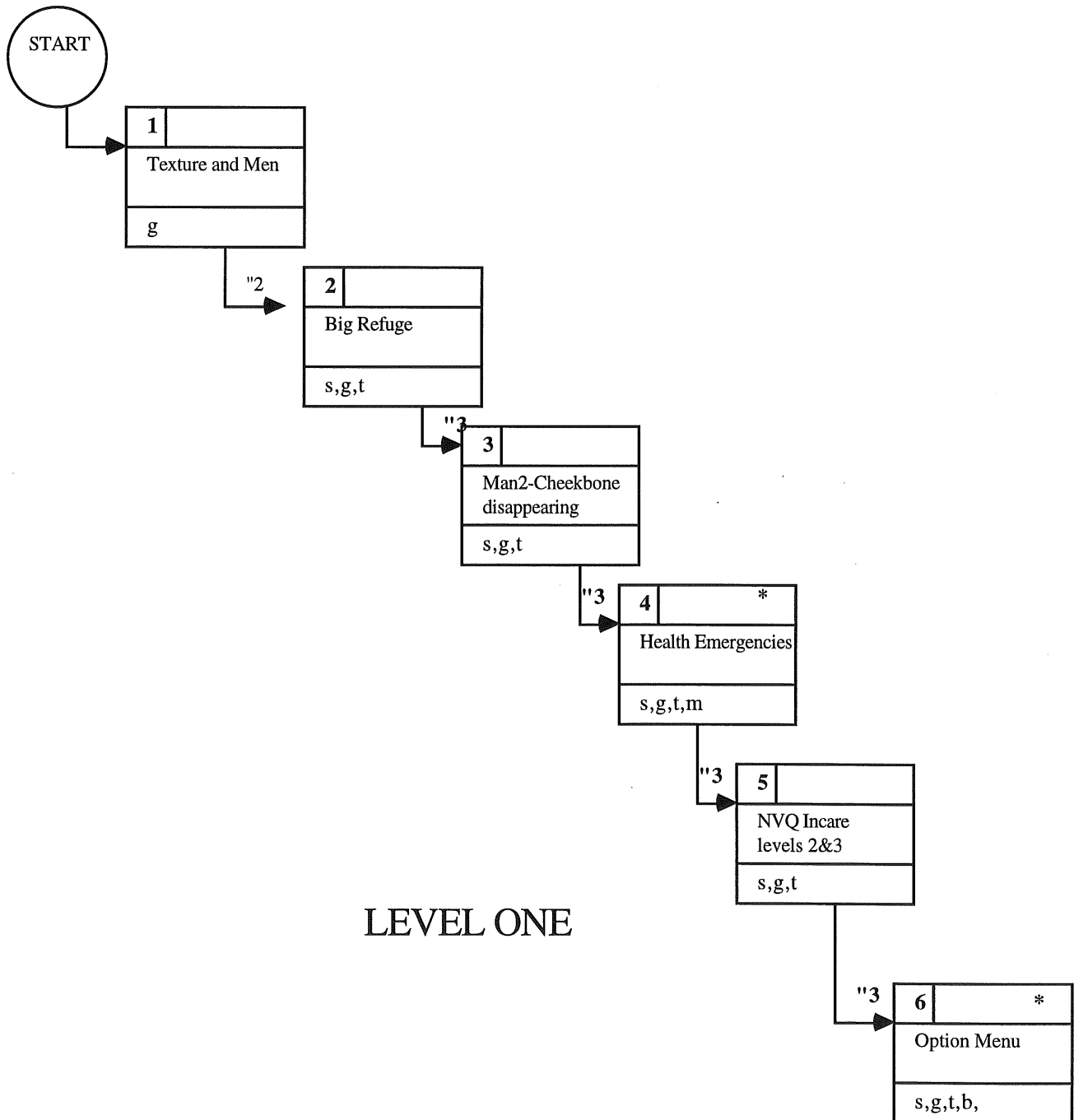Refuge is an interactive multimedia learning package for health care assistants studying at NVQ levels 2 & 3.

Refuge focuses on the topic of medical emergencies, providing a computer simulated emergency in which the students' responses are judged according to specified criteria. On concluding the course, the students can obtain a printout of their results and a record is kept for future validation.

Refuge may also be used purely as a learning tool.  It is possible to 'explore' the simulation without being tested.  There are two sections of the program which provide interactive reference, including small digital video files illustrating resuscitation techniques.

refuge provides a safe environment in which mistakes can be made and vital gaps in the students' knowledge may be revealed which might otherwise have to wait until the occurrence of a real life emergency.
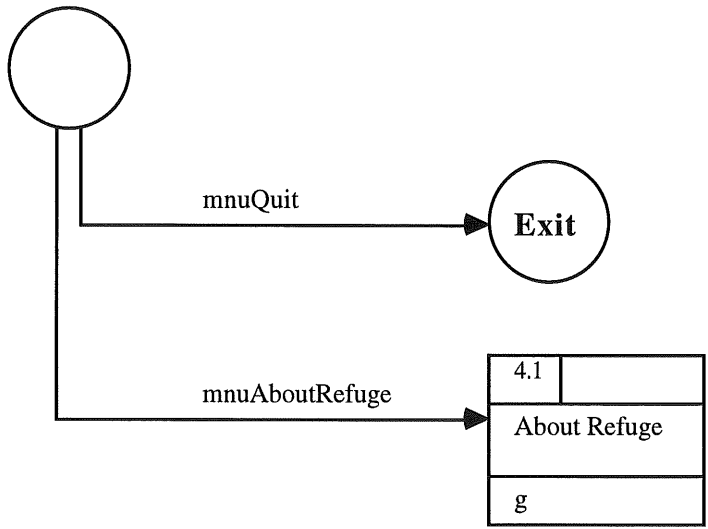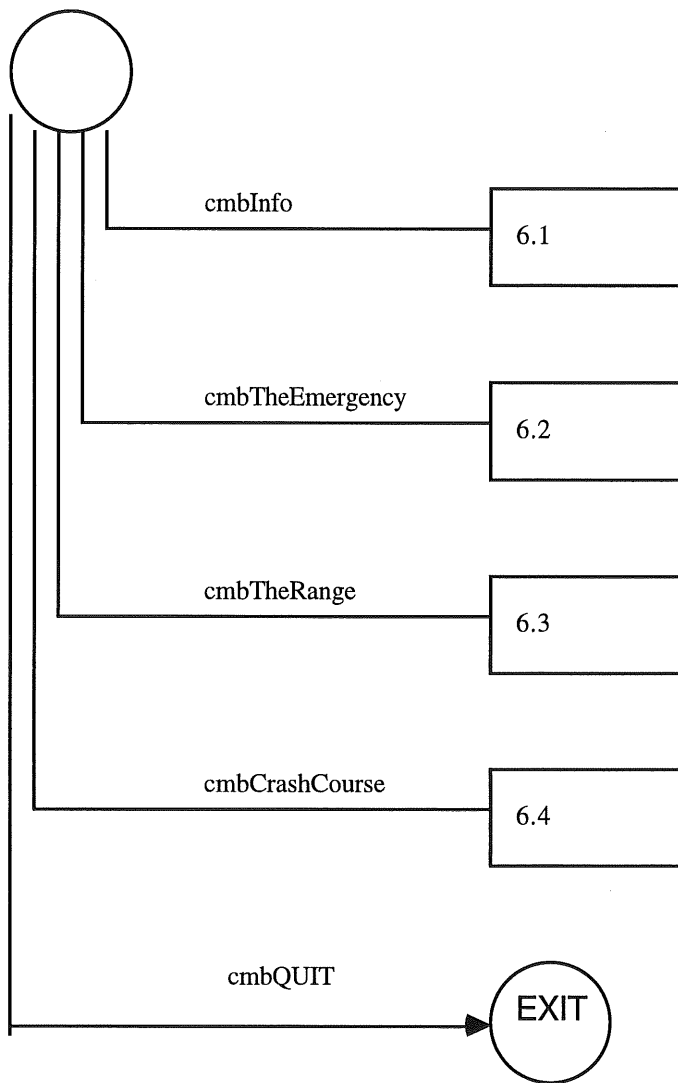
| 0 | * |
|---|---|
| Refuge | |
| a,g,v,s,b | |

# CONTEXT DIAGRAM

START

| 1 | |
|---|---|
| Texture and Men | |
| g | |

"2

| 2 | |
|---|---|
| Big Refuge | |
| s,g,t | |

"3

| 3 | |
|---|---|
| Man2-Cheekbone disappearing | |
| s,g,t | |

"3

| 4 | * |
|---|---|
| Health Emergencies | |
| s,g,t,m | |

"3

| 5 | |
|---|---|
| NVQ Incare levels 2&3 | |
| s,g,t | |

# LEVEL ONE

"3

| 6 | * |
|---|---|
| Option Menu | |
| s,g,t,b, | |

# Health Emergencies 4



mnuQuit

**Exit**

mnuAboutRefuge

| 4.1 | |
|---|---|
| About Refuge | |
| g | |

# LEVEL TWO

# Option Menu 6



cmbInfo — 6.1

cmbTheEmergency — 6.2

cmbTheRange — 6.3

cmbCrashCourse — 6.4

cmbQUIT — EXIT

## LEVEL TWO

Crash Course 6.4



| 6.4.1 | |
|---|---|
| CrashCourse Title | |
| g,s,m | |

"3

| 6.4.2 | * |
|---|---|
| Introduction | |
| s,t,g,a,b | |
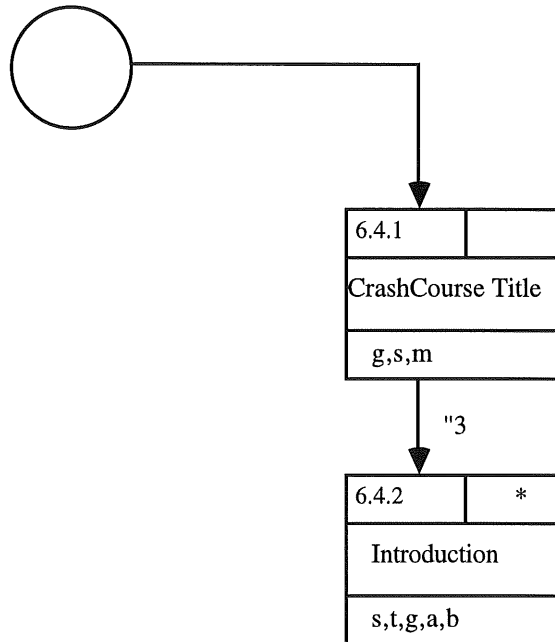
# LEVEL THREE

# Introduction 6.4.2

cmbOption

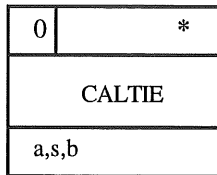| 6.4.2.1 | |
|---------|---|
| Option Menu | |
| | |

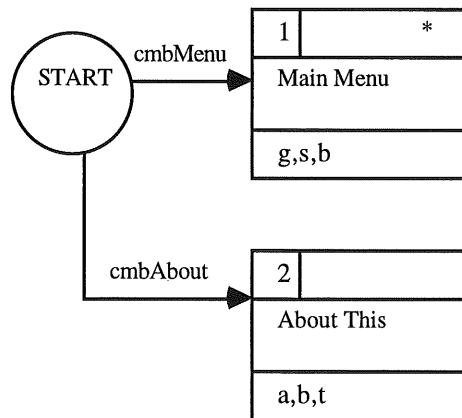cmbNo → 6.4.2.2

cmbYes

| 6 |
|---|
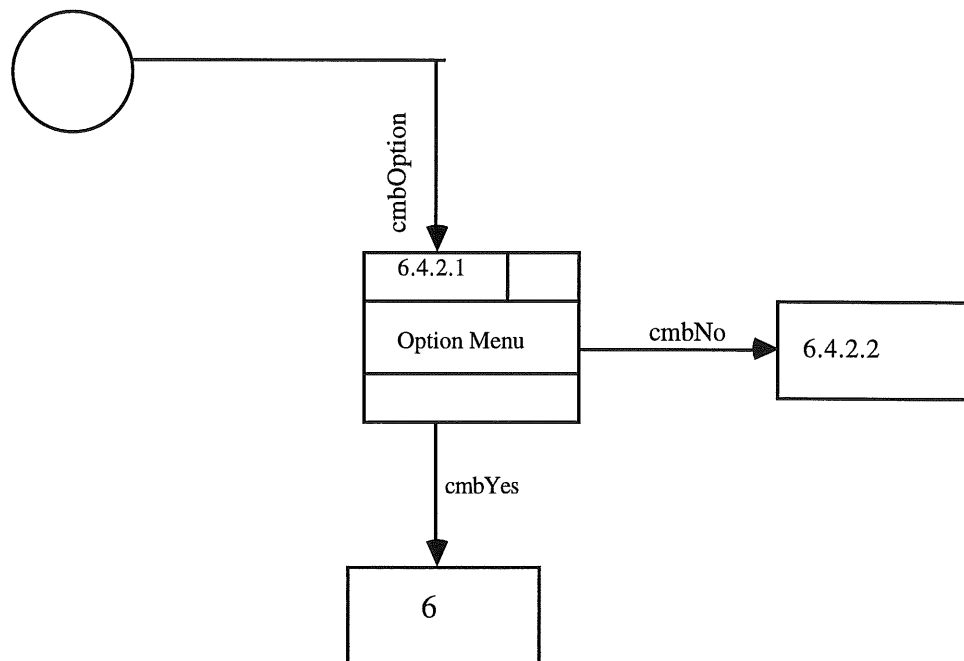
## LEVEL FOUR

# CALTIE

## Computer Aided Laboratory Teaching in Engineering

The CALTIE project is part of the TLTP (Teaching and Learning Technology Program) and is a collaboration between the University of Hertfordshire and Coventry University. The basic remit of the project is to produce twelve computer based laboratories.

The lab modelled in the example is the Aerofoil Pressure lab. It is in three main sections: Theory, Lab and Post Lab. The Theory and Post Lab sections are used away from the physical laboratory. In the actual Lab section the program guides the students and takes readings.
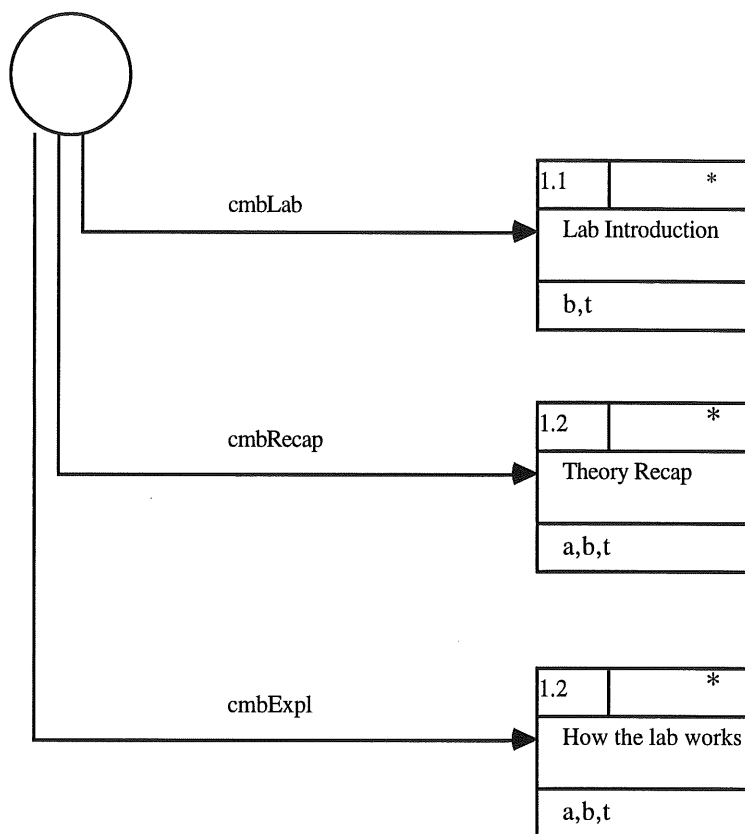
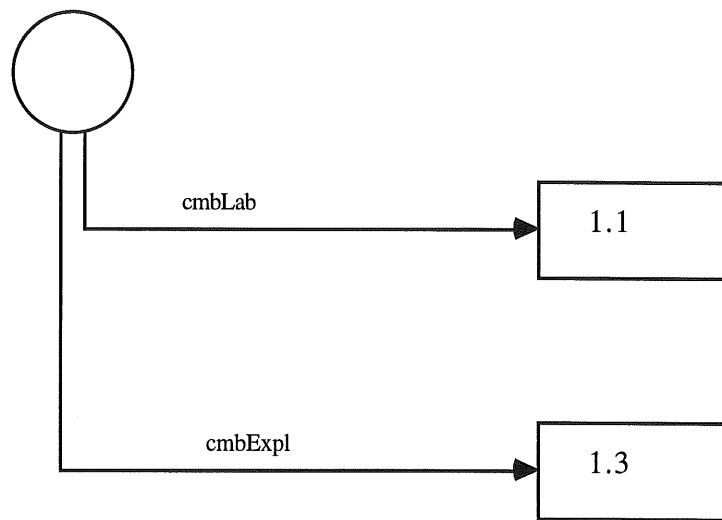| 0 | * |
|---|---|
| CALTIE | |
| a,s,b | |

# CONTEXT DIAGRAM

| 1 | * |
|---|---|
| Main Menu | |
| g,s,b | |

START → cmbMenu

| 2 | |
|---|---|
| About This | |
| a,b,t | |

cmbAbout

# LEVEL ONE

# MAIN MENU 1



cmbLab

| 1.1 | * |
|-----|---|
| Lab Introduction | |
| b,t | |

cmbRecap

| 1.2 | * |
|-----|---|
| Theory Recap | |
| a,b,t | |

cmbExpl

| 1.2 | * |
|-----|---|
| How the lab works | |
| a,b,t | |

# LEVEL TWO

# Theory Recap 1.2

cmbLab → 1.1

cmbExpl → 1.3

## LEVEL THREE

# Lab Introduction 1.1

cmbLab → **1.1**

cmbRecap → **1.2**

1

cmbNextPage →

| 1.1.1 | |
|---|---|
| Constants | |
| t,b | |

cmbNextPage →

| 1.1.2 | |
|---|---|
| Pressures | |
| g,t,b | |

cmbNextPage →

| 1.1.3 | |
|---|---|
| Forces | |
| t,b | |

cmbNextPage →

| 1.1.4 | * |
|---|---|
| Coefficients | |
| g,t,b | |
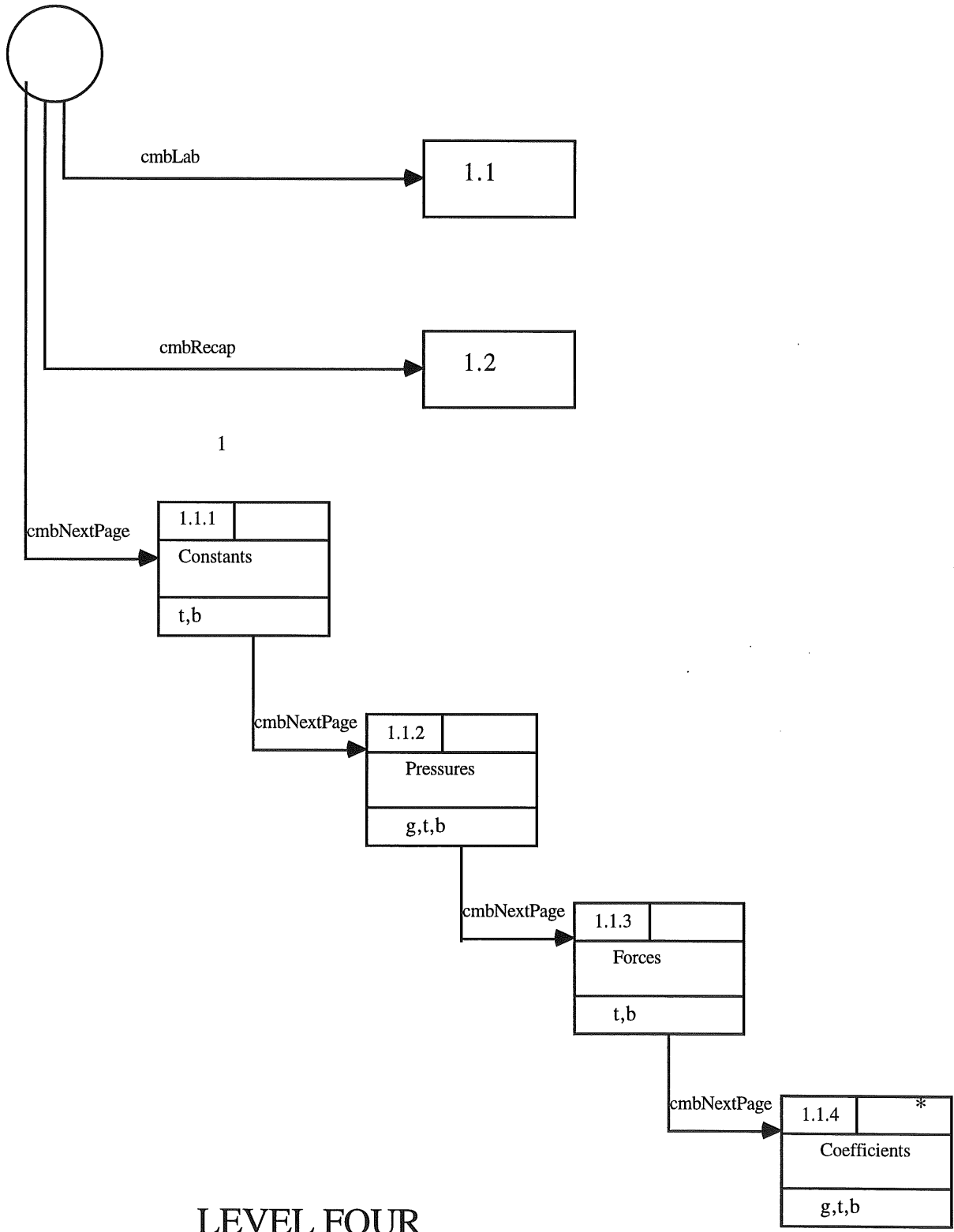
# LEVEL FOUR

# Coefficients 1.1.4



cmbFin

| 1.1 | |
|-----|--|
| Check Alpha | |
| b,t,g | |

+
Incorrect

| 1.1.2 |
|-------|

+
Correct

| 1.1 | |
|-----|--|
| Lab Finalised | |
| b,t,g | |

# LEVEL FIVE