APPENDIX

USER INTERFACE OF CUC MODELS

A.1. SET THE PATH

The programs mentioned in this book, entitled 'Climate Under Cover (CUC in short) , are available from the internet.   The URL of the CUC web-site is listed in the 'Preface of the 2nd edition' of this book.   All the CUC related programs, downloaded from the web-site, should be placed in one directory. The path to the directory should be assigned to MATLAB.   One example is shown in Fig. A.1, which shows the path browser of **MATLAB** with a newly-added-path to a directory named 'C:\matlabR12\work\cuc-book'.
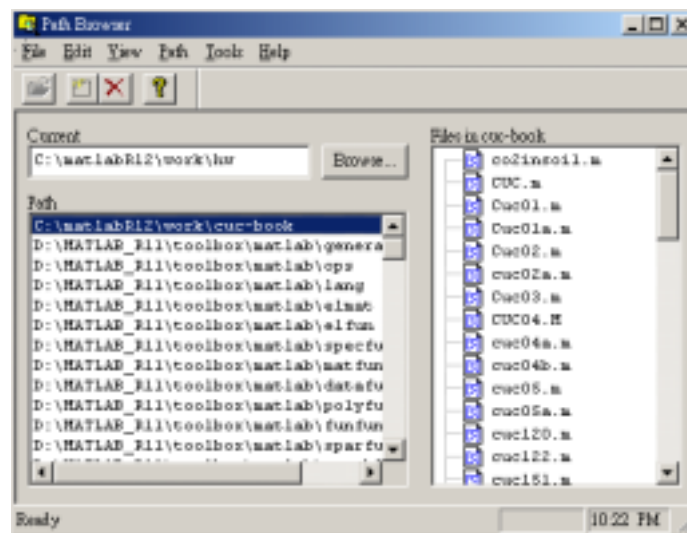

Figure A.1. Path browser of MATLAB v5.3 with the preset path to the directory containing CUC related files .

A.2. MENU AND SUBMENU OF USER INTERFACE

A '**cuc.m**' program was written to help the user in organizing all the models of the CUC book.   By typing 'cuc' in the command window of **MATLAB** and followed by an 'Enter', a figure as shown in Fig. A.2 will pop up.   This is the governing figure of all models.   As shown in the second line from the top is the main menu containing options of 'Chap.3' to 'Chap.11' and 'Help'.

Fig. A.3 shows the submenu of 'Chap.3' option.   In this submenu, there are 5 sub-options divided into 3 blocks.   The first two will execute '**cuc01**' and '**cuc01a**'

models.   The third sub-option: 'close this' will close this main figure and the fourth sub-option 'close all' will close all the open figures.   The last sub-option is to 'Quit Matlab'.   Press Control key and Q key together is the quick exit to 'Quit Matlab'. This sub-option will close all figures and exit from **MATLAB**.
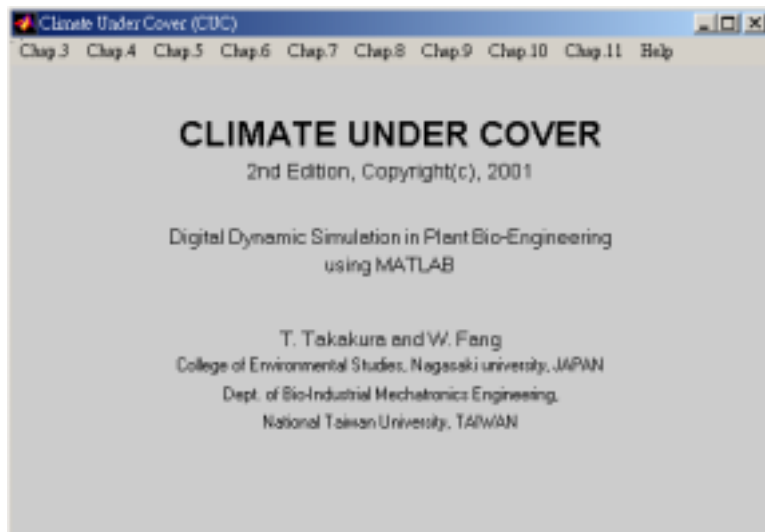

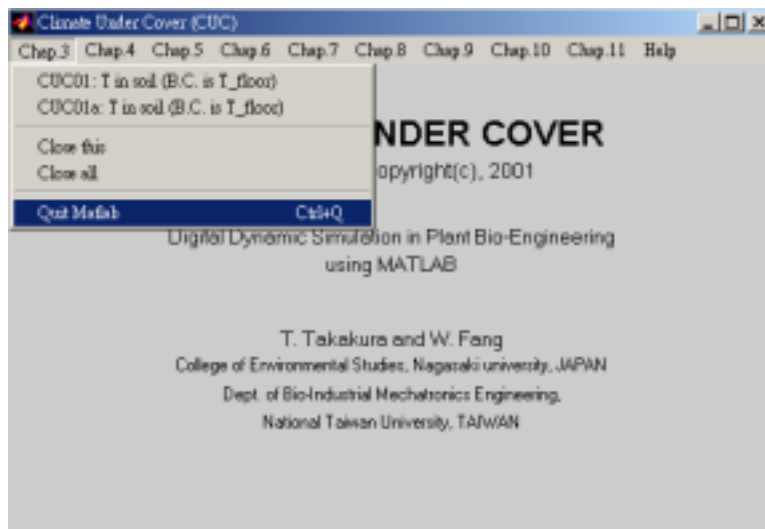*Figure A.2. Snapshot of the first figure of '**cuc.m**' program.*

Figure A.3. Submenu under Chap.3 option.

Fig. A.4 shows the submenu of 'Chap.4' and 'Chap.5' options.   Fig. A.5 shows the submenu of 'Chap.6' and 'Chap.7' options.   Fig. A.6 shows the submenu of 'Chap.8' and 'Chap.9' options.   Fig. A.7 shows the submenu of 'Chap.10' and Fig. A.8 shows the submenu of 'Chap.11' and 'Help' options.
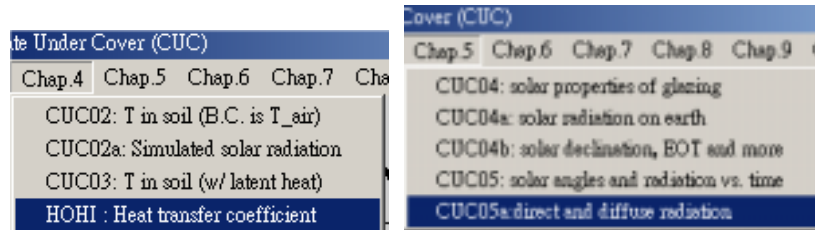

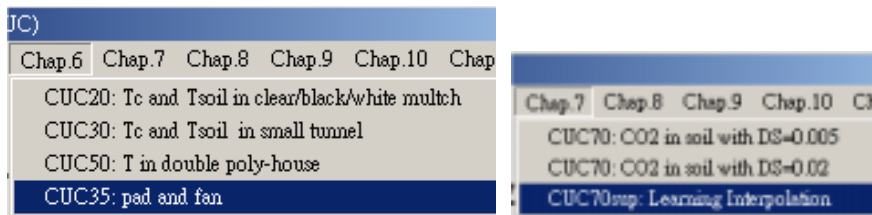*Figure A.4. Submenus under Chap.4 and Chap.5 options.*

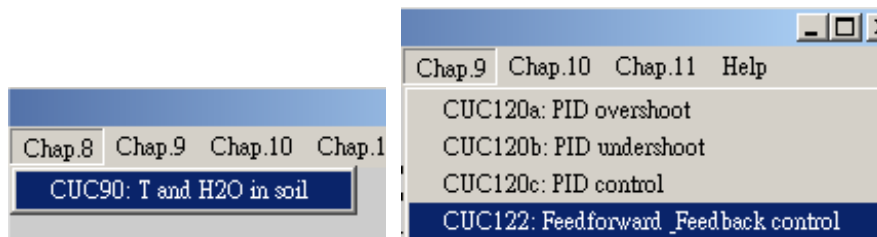*Figure A.5. Submenus under Chap.6 and Chap.7 options.*

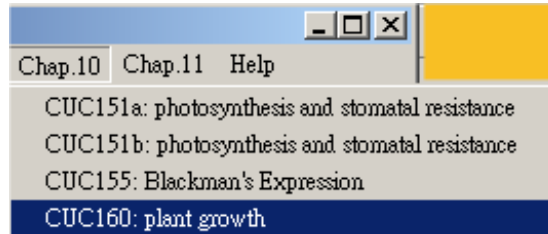*Figure A.6. Submenus under Chap.8 and Chap.9 options.*

Figure A.7. Submenu under Chap.10 option.

Figure A.8. Submenus under Chap.11 and Help options.

A.3. SOURCE CODE OF USER INTERFACE (**CUC**)

Fig. A.9 shows the source code of '**cuc.m**' program.   As listed in the second line of the source code, **cuc** program is a function with one parameter named 'action'.   If user enter only 'cuc' in the command window, the number of argument (n**argin**) is 0. In this case, the program will execute the 'init' portion within '**switch…case…end**'. There are 6 more cases besides 'init'.   In this program, the powerful '**uimenu**' and '**uicontrol**' commands were used to create user interfaces as shown in Fig.A.2 to Fig.A.8.

A.3.1. User interface menu (**uimenu**)

Uimenu creates a menu on the menu bar at the top of the current figure window, and returns a handle to it.   The first 3 lines after '%--[option1]--' in Fig. A.9 are as follows:

```
f1 = uimenu('Label', 'Chap.3');

uimenu(f1,'Label', 'CUC01: T in soil (B.C. is T_floor)', ...
                     'Callback','cuc01');
```

The left hand side of the first line is f1, which is the name of the 'handle'.   The label of this handle is 'Chap.3' .   The second line execute **uimenu** with f1 handle, which means it is the sub-option of 'Chap.3' menu and the label is 'CUC01: T in soil (B.C. is T_floor)'.   When this sub-option is selected, the program will execute the value of 'Callback' property. In this case, the 'cuc01.m' program will be executed. The third **uimenu** of the same section is as follows:

```
uimenu(f1,'Label','Close this','Callback','cuc(''diabox'')', ...
                 'Separator','on');
```

The value of 'Callback' property is 'cuc(''diabox''). This means when 'Close this' sub-option is selected, the program will execute **cuc** program again with 'diabox' as the input parameter. This will execute the portion under

```
case 'diabox'.
```

A.3.2. question dialog box (*questdlg*)

In the 'diabox' section, the question dialog box is used. The scripts such as ButtonName = **questdlg** (question) creates a modal dialog box that automatically wraps the string question to fit an appropriately sized window.   The name of the button that is pressed is returned in ButtonName.   The default set of buttons names for **questdlg** are 'Yes','No' and 'Cancel'. The user can decide what to do next using '**switch**..**case**…**end**' function afterward.

A.3.3. User interface controller (*uicontrol*)

The user interface controller (**uicontrol**) creates a user interface control in the current figure window and returns a handle to it.   Execute **get**(handle) to see a list of **uicontrol** object properties and their current values.   In this program, the '**style**' property with the value 'text' and the value 'pushbutton' were used. Other properties and values please see online help of **MATLAB**.

```
% User interface for CUC models                              CUC.m
function cuc(action)
if nargin==0,   action='init';  end;
clc
switch (action)
case 'init'
h1=findobj('tag','CUC_MAIN');   close(h1);
figure('tag','CUC_MAIN','Resize','on','MenuBar','none',...
  'Name','Climate Under Cover (CUC)','NumberTitle','off',...
  'Position',[200,200,520,320],'color',[0.8 0.8 0.8]);
%--[option1]-------------------------------------------------
f1 = uimenu('Label','Chap.3');
uimenu(f1,'Label','CUC01: T in soil (B.C. is T_floor)', ...
  'Callback','cuc01');
uimenu(f1,'Label','CUC01a: T in soil (B.C. is T_floor)', ...
  'Callback','cuc01a');
uimenu(f1,'Label','Close this','Callback','cuc(''diabox'')', ...
   'Separator','on');
uimenu(f1,'Label','Close all','Callback','cuc(''CloseAll'')');
uimenu(f1,'Label','Quit Matlab','Callback','exit', ...
   'Separator','on','Accelerator','Q');
%--[option2]-------------------------------------------------
f2 = uimenu('Label','Chap.4');
uimenu(f2,'Label','CUC02: T in soil (B.C. is T_air)','Callback','cuc02');
uimenu(f2,'Label','CUC02a: Simulated solar radiation', ...
```

```
    'Callback','cuc02a');
uimenu(f2,'Label','CUC03: T in soil (w/ latent heat)', ...
    'Callback','cuc03');
uimenu(f2,'Label','HOHI : Heat transfer coefficient', ...
    'Callback','cuc(''runhohi'')');
%--[option3]-----------------------------------------------------
f3 = uimenu('Label','Chap.5');
uimenu(f3,'Label','CUC04: solar properties of glazing', ...
    'Callback','cuc04');
uimenu(f3,'Label','CUC04a: solar radiation on earth', ...
    'Callback','cuc04a');
uimenu(f3,'Label','CUC04b: solar declination, EOT and more', ...
    'Callback','cuc04b');
uimenu(f3,'Label','CUC05: solar angles and radiation vs. time ', ...
    'Callback','cuc05');
uimenu(f3,'Label','CUC05a:direct and diffuse radiation ', ...
    'Callback','cuc05a');
%--[option4]-----------------------------------------------------
f4 = uimenu('Label','Chap.6');
uimenu(f4,'Label','CUC20: Tc and Tsoil in clear/black/white multch', ...
    'Callback','test0(''cuc20'')');
uimenu(f4,'Label','CUC30: Tc and Tsoil  in small tunnel', ...
    'Callback','cuc30');
uimenu(f4,'Label','CUC50: T in double poly-house','Callback','cuc50');
uimenu(f4,'Label','CUC35: pad and fan','Callback','cuc35');
%--[option5]-----------------------------------------------------
f5 = uimenu('Label','Chap.7');
uimenu(f5,'Label','CUC70: CO2 in soil with DS=0.005', ...
    'Callback','cuc70(1)');
uimenu(f5,'Label','CUC70: CO2 in soil with DS=0.02', ...
    'Callback','cuc70(2)');
uimenu(f5,'Label','CUC70sup: Learning Interpolation', ...
    'Callback','cuc70sup');
%--[option6]-----------------------------------------------------
f6 = uimenu('Label','Chap.8');
uimenu(f6,'Label','CUC90: T and H2O in soil','Callback','cuc90');
%--[option7]-----------------------------------------------------
f7 = uimenu('Label','Chap.9');
uimenu(f7,'Label','CUC120a: PID overshoot','Callback','cuc120(2)');
uimenu(f7,'Label','CUC120b: PID undershoot','Callback','cuc120(3)');
uimenu(f7,'Label','CUC120c: PID control','Callback','cuc120(1)');
uimenu(f7,'Label','CUC122: Feedforward & Feedback control', ...
    'Callback','cuc122');
%--[option8]-----------------------------------------------------
f8 = uimenu('Label','Chap.10');
uimenu(f8,'Label','CUC151a: photosynthesis and stomatal resistance', ...
    'Callback','cuc151(1)');
uimenu(f8,'Label','CUC151b: photosynthesis and stomatal resistance', ...
    'Callback','cuc151(2)');
uimenu(f8,'Label','CUC155: Blackman''s Expression','Callback','cuc155');
uimenu(f8,'Label','CUC160: plant growth','Callback','cuc160');
%--[option9]-----------------------------------------------------
f9 = uimenu('Label','Chap.11');
uimenu(f9,'Label','CUC170: Tissue culture vessel','Callback','cuc170');
%--[option10]----------------------------------------------------
f10 = uimenu('Label','Help');
uimenu(f10,'Label','About Author','Callback','cuc(''author'')');
uimenu(f10,'Label','About Software','Callback','cuc(''version'')');
```

```
%------------------------------------------------------------------
maintxt1a='CLIMATE UNDER COVER';
maintxt1b='2nd Edition, Copyright(c), 2001';
maintxt2a='Digital Dynamic Simulation in Plant Bio-Engineering';
maintxt2b='using MATLAB';
maintxt3a='T. Takakura and W. Fang';
maintxt3b='College of Environmental Studies, Nagasaki university, JAPAN';
maintxt3c='Dept. of Bio-Industrial Mechatronics Engineering,';
maintxt3d='National Taiwan University, TAIWAN';
t1a = uicontrol('Units','normalized','Position',[.1, .8, .8, .1],...
   'string',maintxt1a,'style','text','fontname','Courier New', ...
   'fontSize',18,'FontWeight','Bold','backgroundcolor',[0.8 0.8 0.8]);
t1b = uicontrol('Units','normalized','Position',[.1, .75, .8, .05],...
    'string',maintxt1b,'style','text','fontname','Courier New',...
    'fontSize',10,'backgroundcolor',[0.8 0.8 0.8]);
t2a = uicontrol('Units','normalized','Position',[.1, .6, .8, .06],...
    'string',maintxt2a,'style','text','fontSize',12,...
    'backgroundcolor',[0.8 0.8 0.8]);
t2b = uicontrol('Units','normalized','Position',[.1, .54, .8, .06],...
    'string',maintxt2b,'style','text','fontSize',12,...
    'backgroundcolor',[0.8 0.8 0.8]);
t3a = uicontrol('Units','normalized','Position',[.1, .38, .8, .06],...
    'string',maintxt3a,'style','text','fontSize',12,...
    'backgroundcolor',[0.8 0.8 0.8]);
t3b = uicontrol('Units','normalized','Position',[.1, .32, .8, .06],...
    'string',maintxt3b,'style','text','fontSize',8,...
    'backgroundcolor',[0.8 0.8 0.8]);
t3c = uicontrol('Units','normalized','Position',[.1, .26, .8, .06],...
    'string',maintxt3c,'style','text','fontSize',8,...
    'backgroundcolor',[0.8 0.8 0.8]);
t3d = uicontrol('Units','normalized','Position',[.1, .2, .8, .06],...
    'string',maintxt3d,'style','text','fontSize',8,...
    'backgroundcolor',[0.8 0.8 0.8]);
%------------------------------------------------------------------
case 'cuc20'
  cuc20(1);   cuc20(2);     cuc20(3);
%------------------------------------------------------------------
case 'diabox'
  selection = questdlg('Close Current Figure?', 'What''s next?',...
                'Yes','No','Cancel');
  switch selection,
   case 'Yes',
       delete(gcf);
   case {'No','Cancel'}
       return
    end
%------------------------------------------------------------------
case 'runhohi'
   figure;   hohi;  % run hohi.m
%------------------------------------------------------------------
case 'CloseAll'
   close all;
%------------------------------------------------------------------
case 'version'
   figure('tag','INPUT','Resize','off','MenuBar','none','Name', ...
       'Version 2.0','NumberTitle','off','Position',[140,200,200,60]);
   t1 = uicontrol('Units','normalized','Position',[.1, .1, .8, .8],...
     'string','Updated: 2002/3/12.','style','text');
```

```
   act1 = uicontrol('Units','normalized','Position',[.4,.1, .2, .3],...
     'string','O.K.', 'style','pushbutton','callback','close');
%--------------------------------------------------------------
case 'author'
  figure('tag','INPUT','Resize','off','MenuBar','none',  ...
       'Name','Program written by ',  ...
       'NumberTitle','off','Position',[140,200,250,100]);
  txt1='Professor Wei Fang, Ph.D., ';
  txt2='Dept. of Bio-Industrial Mechatronics Engineering, ';
  txt3='National Taiwan University, Email: weifang@ccms.ntu.edu.tw';
  showtxt=[txt1 txt2 txt3];
  t1 = uicontrol('Units','normalized','Position',[.1, .1, .8,.8],...
       'string',showtxt,'style','text');
  act1 = uicontrol('Units','normalized','Position',[.4,.1,.2,.2],...
   'string','O.K.','style','pushbutton',...
   'callback','close');
end
```

*Figure A.9. Scripts of user interface program (**cuc.m**).*