CSE 259 - Logic in Computer Science
Fall 2024

Recitation-5

Project-1: Printing ASU Part 1

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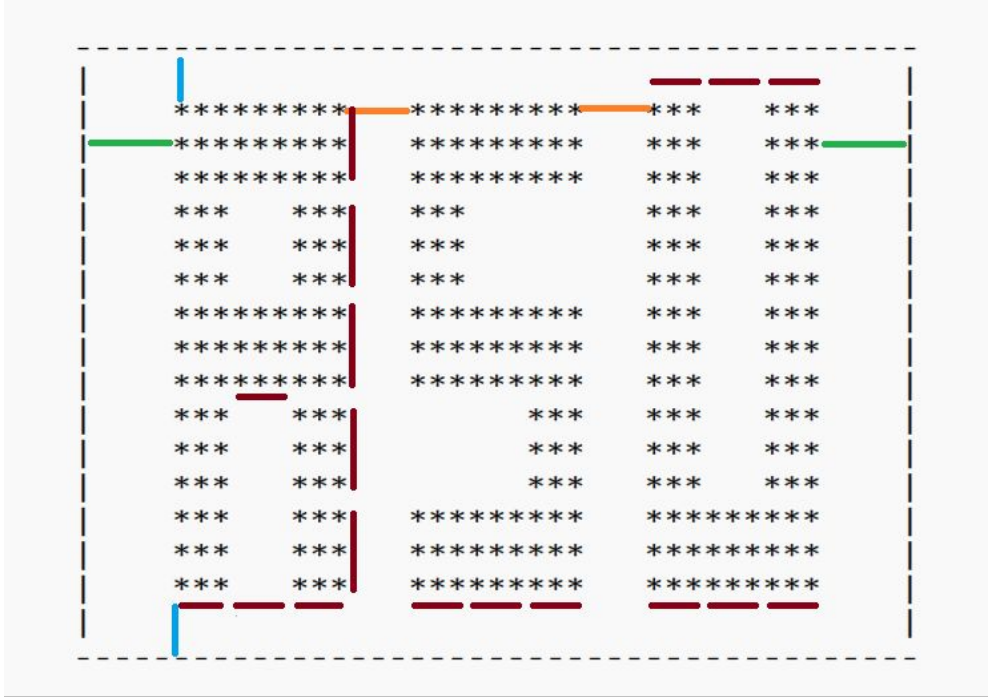
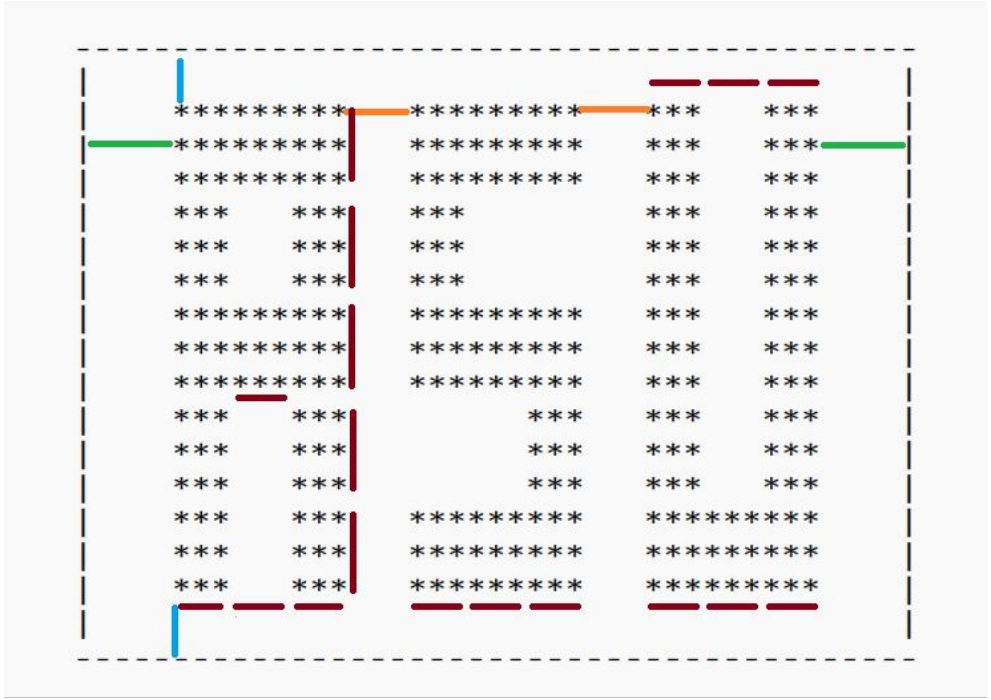
Project-1

- Use the query ***asu(LeftRightMargin, BottomTopMargin, SpaceBetweenCharacters, FontSize)***
- The output should look like the following



How to implement

- Print the horizontal top line
- Print vertical lines with spaces for BottomTopMargin number of times
- Print vertical lines with * and spaces
- Print vertical lines with spaces for BottomTopMargin number of times
- Print the horizontal bottom line



How to implement

```
      You, 9 minutes ago • fixed bug
asu(LeftRightMargin, BottomTopMargin, SpaceBetweenCharacters, FontSize) :-
  integer(LeftRightMargin), integer(BottomTopMargin), integer(SpaceBetweenCharacters), integer(FontSize),
  Width is (LeftRightMargin * 2 + SpaceBetweenCharacters * 2 + FontSize * 3 * 3 + 2),
  Height is (BottomTopMargin * 2 + FontSize * 5),

  drawHorizontalLine('-', Width),
  nl,
  drawVerticalLinesWithSpace('|', BottomTopMargin, Width),
  drawVerticalLinesWithCharacters(LeftRightMargin, BottomTopMargin, SpaceBetweenCharacters, FontSize),
  drawVerticalLinesWithSpace('|', BottomTopMargin, Width),
  drawHorizontalLine('-', Width).
```

Understanding the template

- drawHorizontalLine('-', Width) is the same as before. Like we have drawn the rectangle in the last class!
- drawVerticalLinesWithSpace('|', BottomTopMargin, Width) draws the vertical lines just with spaces.
- drawVerticalLinesWithCharacters(LeftRightMargin, BottomTopMargin, SpaceBetweenCharacters, FontSize) draws the vertical lines with * and space characters.

Understanding the template

drawVerticalLinesWithCharacters

- Calculates the width and height of the letters: A, S, and U
- Width would be horizontal segment size x font size: 3 * FontSize
- Height would be vertical segment size x font size: 5 * FontSize
- Initiate a variable called CurrentLine with 0
- This function is like a driver code. Think of an DFS algorithm implementation in C++. We use a driver function to initialize things and then call a recursive function. Same thing will be done here. We are going to call a recursive rule called **draw** from **drawVerticalLinesWithCharacters**

Understanding the template

```
drawVerticalLinesWithCharacters(LeftRightMargin, BottomTopMargin, SpaceBetweenCharacters, FontSize) :-
    CurrentLine is 0,
    TextWidth is FontSize * 3,       You, 22 minutes ago • fixed bug
    TextHeight is FontSize * 5,
    draw(LeftRightMargin, SpaceBetweenCharacters, FontSize, CurrentLine, TextWidth, TextHeight).
```

Understanding the template

draw(LeftRightMargin, SpaceBetweenCharacters, FontSize, CurrentLine, TextWidth, TextHeight)

- If CurrentLine is less than the TextHeight then do things to print. Else don’t do anything
- Initiate ColumnNumber = 0
- Print | and then space
- Print the necessary characters for the letter A for the current line
- Print space between letters
- Print the necessary characters for the letter S for the current line
- Print space between letters
- Print the necessary characters for the letter U for the current line
- Print space and then |

Understanding the template

```
draw(LeftRightMargin, SpaceBetweenCharacters, FontSize, CurrentLine, TextWidth, TextHeight) :-
  CurrentLine >= TextHeight.
draw(LeftRightMargin, SpaceBetweenCharacters, FontSize, CurrentLine, TextWidth, TextHeight) :-
  CurrentLine < TextHeight,
  ColumnNumber is 0,
  write('|'), drawSymbol(' ', LeftRightMargin),
  drawA(TextWidth, TextHeight, FontSize, CurrentLine, ColumnNumber),
  /*-------------------------------------------*/
  /** WRITE YOUR CODES HERE **/
  % add spaces here between A and S
  % drawS
  % add spaces here between S and U
  % drawU
  /*-------------------------------------------*/
  drawSymbol(' ', LeftRightMargin),
  write('|'),
  nl,
  NextLine is CurrentLine + 1,
  draw(LeftRightMargin, SpaceBetweenCharacters, FontSize, NextLine, TextWidth, TextHeight).
```

Understanding the template - draw A

- Use four different rules

Understanding the template - draw A

Rule-1

- We draw the letters line by line, i.e., 1st line of A, S, and U then 2nd line, then 3rd line, and so on.
- Before starting to draw each letter, RESET ColumnNumber to 0
- The first rule would just check whether ColumnNumber is greater or equal to the required width of the letter

```
drawA(TextWidth, TextHeight, FontSize, CurrentLine, ColumnNumber) :-
    ColumnNumber >= TextWidth.
```

Understanding the template - draw A

Rule-2

- Covers the left most segment and the rightmost segment
- If FontSize = 3, TextWidth = 9
- Left-most segment has ColumnNumber 0, 1, 2 and Right-most segment has ColumnNumber 6, 7, 8
- So, we generalize the formula in the code

```
drawA(TextWidth, TextHeight, FontSize, CurrentLine, ColumnNumber) :-
  (
    (ColumnNumber >= 0, ColumnNumber < FontSize);
    (ColumnNumber >= FontSize * 2, ColumnNumber < TextWidth )
  ),
  drawSymbol('*', FontSize),
  NextColumn is ColumnNumber + FontSize,
  drawA(TextWidth, TextHeight, FontSize, CurrentLine, NextColumn).
```

Understanding the template - draw A

Rule-3

- Covers the marked segments of the middle segement
- If FontSize = 3, TextWidth = 9 then covers ColumnNumber 3, 4, 5
- CurrentLine can be either 0 <= CurrentLine < 3 or 6 <= CurrentLine < 9
- So, we generalize the formula in the code

```
drawA(TextWidth, TextHeight, FontSize, CurrentLine, ColumnNumber) :-
  (ColumnNumber >= FontSize, ColumnNumber < FontSize * 2),
  (
    (CurrentLine >= 0, CurrentLine < FontSize);
    (CurrentLine >= FontSize * 2 , CurrentLine < FontSize * 3)
  ),
  drawSymbol('*', FontSize),
  NextColumn is ColumnNumber + FontSize,
  drawA(TextWidth, TextHeight, FontSize, CurrentLine, NextColumn).
```

Understanding the template - draw A

Rule-4

- Covers the marked segments of the middle segement
- If FontSize = 3, TextWidth = 9 then covers ColumnNumber 3, 4, 5
- CurrentLine can be either 3 <= CurrentLine < 6 or 9 <= CurrentLine < TextHeight
- So, we generalize the formula in the code

```
drawA(TextWidth, TextHeight, FontSize, CurrentLine, ColumnNumber) :-
  (ColumnNumber >= FontSize, ColumnNumber < FontSize * 2),
  (
    (CurrentLine >= FontSize, CurrentLine < 2 * FontSize);
    (CurrentLine >= FontSize * 3, CurrentLine < TextHeight)
  ),
  drawSymbol(' ', FontSize),
  NextColumn is ColumnNumber + FontSize,
  drawA(TextWidth, TextHeight, FontSize, CurrentLine, NextColumn).
```

Understanding the template

```
/*-----------------------------------------*/
/** WRITE YOUR CODES HERE **/
% add spaces here between A and S
ColumnNumber is 0,
% drawS
% add spaces here between S and U
ColumnNumber is 0,
% drawU
/*-----------------------------------------*/
```