CS335 Project - Milestone 1
Group 32

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1 AST Specifications

The Python version we have selected is `3.6`. We began by using the official grammar provided for python 3.6. First we modified it into a form which is acceptable to Bison. Then we had some conflicts which we resolved. Then using this, first we made the parse tree. The following changes were made to the parse tree to produce our AST.

- Removing productions not required, example star-expressions, generator expression etc.
- In case of productions where there was a single (non)terminal on the RHS, we prunned such nodes.
- Nodes for `NEWLINE`, `INDENT` and `DEDENT` terminals have been excluded
- Most of the operators nodes were re-arranged so that the operands are the children.
- Based on the context, appropriate names decided for the non-terminal nodes
- Terminals are in round nodes while non-terminals are in box nodes

2 Usage

We have used a wrapper script so that the process becomes easier. The inputs to the script will be the Python source-code file and the name of the AST's PDF file. The script will first `make`, and then produce the output PDF file. It will also create a file named `graph.dot`, which will have dot language description of the AST. In case of errors, the PDF file will not be generated. The script name is `make_ast.sh`.
We have supported the options:

- `-v`, `--verbose`: To output the details of nodes being created as and when they are made.
- `-i`, `--input`: To specify the input python program file.
- `-o`, `--output`: To specify the output PDF file in which the AST has to be written to.
- `-h`, `--help`: To get basic information on the usage of the `make_ast.sh`.

Syntax:
`./make_ast.sh [options] <inputfile> <outputfile>`

Example Usage:
```
./make_ast.sh test1.py graph.pdf
./make_ast.sh -v --input test1.py -o graph.pdf
./make_ast.sh --verbose --input test1.py graph.pdf
```

3 Tools Used

The following tools (along with their version numbers) were used for this milestone:

- Flex 2.6.4
- Bison 3.8.2
- dot - graphviz version 2.43.0 (0)
- g++ (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0
- GNU Make 4.3

If these tools are not already installed, we can install them using:

```
sudo apt update
sudo apt install flex
sudo apt install bison
sudo apt install graphviz
sudo apt install make
sudo apt install g++
```

4 References

- `https://docs.python.org/3.6/reference/grammar.html`
- `https://docs.python.org/3.6/reference/lexical_analysis.html`
- `https://graphviz.org/doc/info/lang.html`
- `/usr/share/doc/util-linux/examples/getopt-example.bash`