ENGL 516:
Methods of Formal Linguistic Analysis

Semester: Spring '18

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Class outline

- Recap of Week 1
- Warmup questions on readings
- Pre-programming 1: Flowchart
- Pre-programming 2: Algorithm
- Python and Pycharm installation issues
- Getting started with Python
- Reminder: Assignment 1 Deadline on 20th January 2018

Week 1 Recap

- Course description and expectations
- "The English Teacher as a Programmer" discussion
- What is computing, history of computing, What is a program?
- Small exercises related to logical thinking and problem solving
- Assignment 1 description

Questions on Readings

Chapter 1 in Severence's book

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- What is a syntax error? How do you fix it?

Pre-programming

How to document the steps to solve a problem before writing a program? Two important ways:

1. Flowcharts
2. Algorithms

Pre-programming 1: Flowchart

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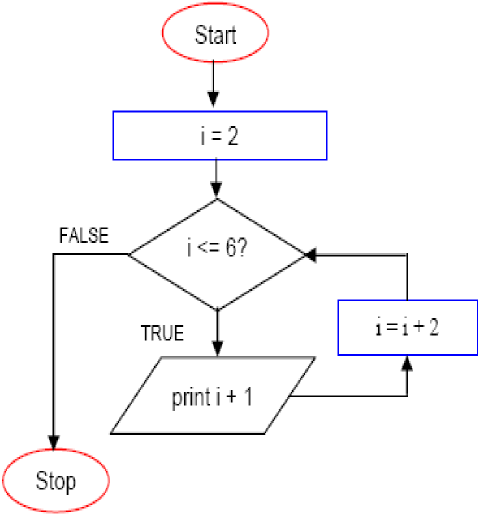
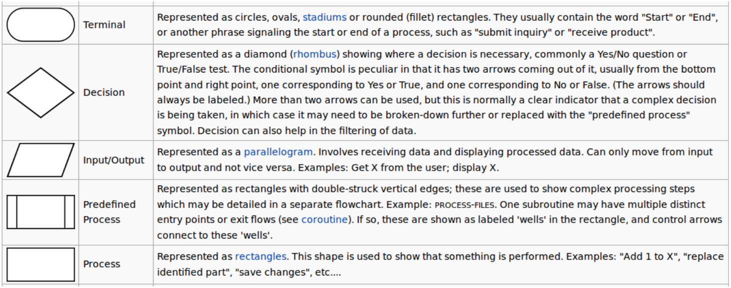
- Why are they used?: Design and analyze programs (in programming), describe the workflow in a process (more general use) etc.
- How is it useful for us in this class?: to visualize the various steps involved in your program, thereby help you program correctly.

An Example Flowchart



(source: `http://goo.gl/Q5WqGI`)

What do those shapes mean?



⬭	Terminal	Represented as circles, ovals, stadiums or rounded (fillet) rectangles. They usually contain the word "Start" or "End", or another phrase signaling the start or end of a process, such as "submit inquiry" or "receive product".
◇	Decision	Represented as a diamond (rhombus) showing where a decision is necessary, commonly a Yes/No question or True/False test. The conditional symbol is peculiar in that it has two arrows coming out of it, usually from the bottom point and right point, one corresponding to Yes or True, and one corresponding to No or False. (The arrows should always be labeled.) More than two arrows can be used, but this is normally a clear indicator that a complex decision is being taken, in which case it may need to be broken-down further or replaced with the "predefined process" symbol. Decision can also help in the filtering of data.
▱	Input/Output	Represented as a parallelogram. Involves receiving data and displaying processed data. Can only move from input to output and not vice versa. Examples: Get X from the user; display X.
◫	Predefined Process	Represented as rectangles with double-struck vertical edges; these are used to show complex processing steps which may be detailed in a separate flowchart. Example: PROCESS-FILES. One subroutine may have multiple distinct entry points or exit flows (see coroutine). If so, these are shown as labeled 'wells' in the rectangle, and control arrows connect to these 'wells'.
▭	Process	Represented as rectangles. This shape is used to show that something is performed. Examples: "Add 1 to X", "replace identified part", "save changes", etc....

(source: `https://en.wikipedia.org/wiki/Flowchart`)

An Exercise with Flowcharts

Draw a flowchart for a ESL class placement test. Here are the details:

- Everyone comes and takes an online exam with 40 fill in the blank questions that test English grammar skills. Based on the test, you have to put the test takers into one of the sections: Beginner, Intermediate, Upper intermediate, advanced.

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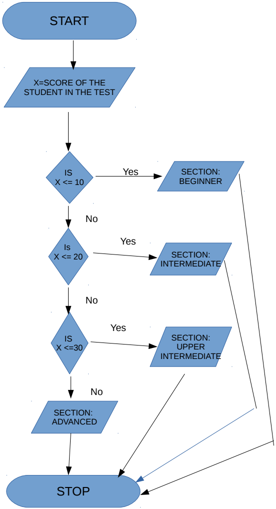
- Let us say anyone who scores less than 10 is a beginner, between 11 and 20 is in intermediate state, 21-30 is Upper intermediate, higher than 30 is advanced.
- Now, draw a flowchart (on paper) where you take a student score on the test as input, and gives one of the sections as output.

One possible solution



Flowcharts: Conclusion

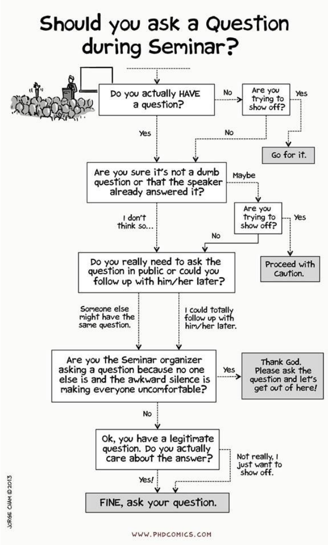
To conclude:

- Flowcharts are very useful to understand how to program.
- Practice drawing flowcharts for anything you want to solve through programming.

Optional Readings for enthusiasts:

1. `http://users.evtek.fi/~jaanah/IntroC/DBeech/3gl_flow.htm` - A lesson on flowcharts.
2. `https://en.wikipedia.org/wiki/Flowchart` - Wikipedia article.

A Fun Flowchart


Should you ask a Question during Seminar?
Do you actually HAVE a question?
No
Are you trying to show off?
Yes
Go for it.
Yes
No
Are you sure it's not a dumb question or that the speaker already answered it?
Maybe
Are you trying to show off?
Yes
Proceed with Caution.
No
I don't think so...
Do you really need to ask the question in public or could you follow up with him/her later?
Someone else might have the same question.
I could totally follow up with him/her later.
Are you the Seminar organizer asking a question because no one else is and the awkward silence is making everyone uncomfortable?
Yes
Thank God. Please ask the question and let's get out of here!
No
Ok, you have a legitimate question. Do you actually care about the answer?
Not really, I just want to show off.
Yes!
FINE, ask your question.
JORGE CHAM © 2013
WWW.PHDCOMICS.COM

(source: PhD Comics. http://www.phdcomics.com/comics.php?f=1632)

Pre-programming 2: Algorithm

- What is an algorithm?: An algorithm is the sequence of steps to solve a problem. It is like a blue print for the program.
- Where is it useful?: To get clarity on how to write your program, to communicate about your program to others who don't know python.
- How is it useful for this class?: To learn to think like a programmer.

An example algorithm

Algorithm to make tea with a pot

1. Pour water in a pot and put it on a stove for boiling.
2. Add tea leaves (depending on the amount of water and your preference) to the pot.
3. When the water starts boiling, turn off the stove.
4. Pour the water from the pot into a cup through a strainer, to discard the leaves.
5. Add sugar if you want.

(Plain algorithm with no loops, no repetitions, no decisions to make)

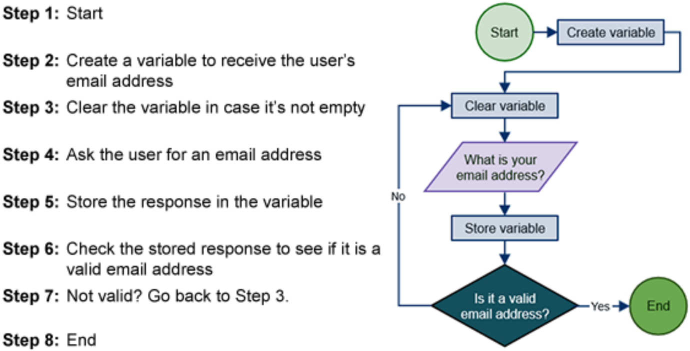
Another example algorithm

Something that is more relevant?

Algorithm to calculate the sum of a given list of numbers.
****

```
start:
Let X be the list of numbers
intialize sum = 0
for each number x in X
add x to sum
After going through all numbers,
print out the value of sum
Stop
```

Flowchart and Algorithm



Step 1: Start

Step 2: Create a variable to receive the user's email address

Step 3: Clear the variable in case it's not empty

Step 4: Ask the user for an email address

Step 5: Store the response in the variable

Step 6: Check the stored response to see if it is a valid email address

Step 7: Not valid? Go back to Step 3.

Step 8: End

(source: `http://study.com/cimages/multimages/16/example-algorithm.png`)

Algorithm: An exercise

Write an algorithm for the same ESL placement test as the flowchart exercise.

Python, PyCharm Installation

- How many of you think you successfully installed Python 3+ and PyCharm?
- install python interpreter on your laptops. `https://www.python.org/downloads/`.
- install PyCharm Edu software on your laptops. `https://www.jetbrains.com/pycharm-edu/download/`.

PyCharm

- Python Console versus Python Program files
- Other stuff: `https://www.jetbrains.com/help/pycharm/quick-start-guide.html`
- Remember: Everything cannot be said in the class. So, be prepared to explore such links on your own if needed.

First steps in Python: Basic Calculations

```
2+3
2-3
2*3
2/3
2%3
5//2
5**2
```

First steps in Python: Variables and Assignments

```
a = 2
b = 4
c = d = 5
e = "python"
trial = 2.4
bunch1 = [1,44,5,53,1]
bunch2 = [1,22,33,3.55,1.5]
bunch3 = [2,1,"Python","Programming"]
```

Note: space here is optional, added only for readability

First steps in Python: Variable naming

- Spaces are not allowed in names
- Names should contain only letters, numbers and underscore
- Names cannot start with a number
- They are case-sensitive (a, A are not the same variable)
- Convention: start with a lowercase character.
- Convention: use underscore between words of a long variable name
- Variable name should not be one of the 'keywords' in Python

First steps in Python: 'keywords' in Python

```
and
as
assert
break
class
continue
def
del
elif
else
except
False
finally
for
from
global
if
import
in
is
lambda
None
nonlocal
not
or
pass
raise
return
True
try
while
with
yield
```

Re-assigning variables

```
first = 1
second = 2
first = "Python3"
first,second=2.5,"Changed"
```

First steps in Python: Quiz

```
a,b,c = 2,3,4 (What is this doing?)
a = b (What is a, b, c after this?)
a == c (What is this??)
d = hello (Will this work?)
e (what happens after this?)
```

rest of the class

- I will walk around and look at installation issues and stuff
- Practise what we discussed so far (on lab computers or your laptops), may be start taking a look at Assignment 1

Next Class

1. Topics: Variables, Expressions, Logical operations
2. ToDo before the class:
   - Read Chapter 2 in textbook
3. If you want more practice:
   3.1 Practice drawing flowcharts and writing algorithms. Practice for problems like: "print all even numbers under 100", "count the number of words in a text" and so on.
   3.2 Visit `https://www.python.org/about/gettingstarted/` and browse through the website to check what resources exist for beginners.