**baseconv.py User Manual**

1. **Reason to make this**

INM1000 extra problem, given by Ms. Minh.

“Base conversion application: An interface (with input, output), explanation of the algorithm used, user manual (\*.doc file)” (rough translation)

I plan to make a fully functional application with a decent GUI, but the timeframe seems to be impossible for this. Therefore, I decided to build this Python script.

1. **Requirements**

Python 3 installed on the system

1. **Usage**

Base conversion for integers.

* 1. python makeconv.py [original\_base] [new\_base] [number] (--verbose)

[original\_base] an integer the base of the given [number]

[new\_base] an integer the base of the wanted result

[number] depends the number wanted to convert

* if [number] <= 16, the input must be written as normal, with common convention (0123456789ABCDEF)
* if [number] > 16, the input must be written as a list of digit, each digit must be written in its base-10 form.

–verbose optional print out the process of conversion

* 1. python makeconv.py –help

It will print the usage

* 1. python makeconv.py any\_kind\_of\_wrong\_usage

Same as b.

1. **Algorithm used**
   1. Binary to Octal/Hexadecimal

Since 8 = 23 and 16 = 24, the binary number could be divided into blocks of 3 or 4 digits. Blocks are taken from right to left.

In this script, zeroes are inserted into the number until its length is divisible by ¾, for the convenience of block division, which is actually done from left to right.

* 1. Octal/Hexadecimal to Binary

The algorithm just simply converts each digit to a block of 3/4 digits, then concatenate all of the blocks altogether

* 1. General case
     1. Convert the original number to base 10

In base k, the value of column i (column 0 is the unit column) is ki.

Multiply each digit to its column’s corresponding value, then add all of the results to get the base-10 value.

* + 1. Convert the base-10 value to the new base

Divide the number to the new base to get the quotient and the remainder, then continue to divide the quotient until there is nothing left. Finally, concatenate all of the digits in the reverse order of appearance.

1. **Future improvements (that will never be built)**

* Support real number base conversion.
* Make an app with a real GUI