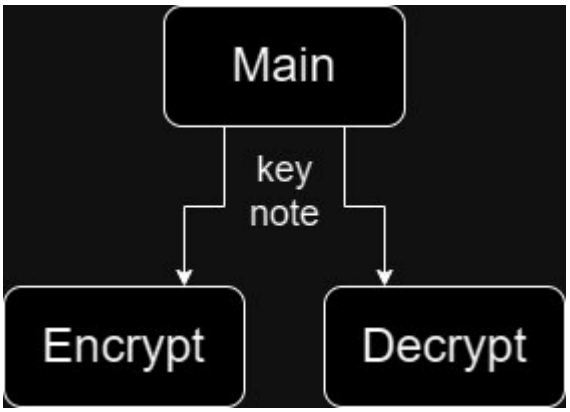
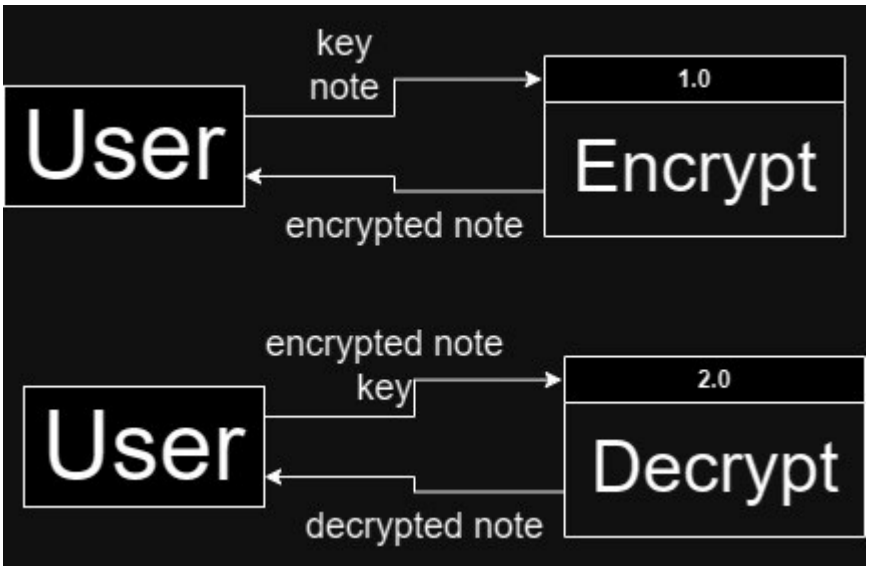
structure chart



data flow chart



pseudocode for most important function

```
def encrypt(int key, string note)
   encrypted = ""
   for character in note
      if character is " " # if the character is a space it adds it to the encrypted string
         encrypted += character
      else if character is upper # if it is upper case it uses the upper case letters in the uni code
         encrypted += chr((ord(character) - ord('A') + key) % 26 + ord('A'))
      else if character is lower # if it is a lower case letter
         encrypted += chr((ord(character) - ord('a') + key) % 26 + ord('a'))
      else
         encrypted += character
   return encrypted
```

algorithmic efficiency

main is O(1) because it doesn't loop

both encrypt and decrypt is O(n) because it loops through each string character and does its thing so longer the string the longer it takes.

maintainability determination
for the simplicity of this program this is really maintainable but if it were to get more complex it would require a lot more work to meet the new complex encrypting method

cohesion and coupling
main is low cohesion and reasonably coupled
both encrypt and decrypt have high cohesion because they focus on a specific cryption task. and they are loosely coupled

program trace
inputs are note = "Hello world 10?" ; key = 5 ; encrypt

iteration	character	is " "	is upper	is lower	new character
1	"H"	false	false	true	"M"
2	"e"	false	false	true	"j"
3	"l"	false	false	true	"q"
4	"l"	false	false	true	"q"
5	"o"	false	false	true	"t"
6	" "	true	false	false	" "
7	"w"	false	false	true	"b"
8	"o"	false	false	true	"t"
9	"r"	false	false	true	"w"
10	"l"	false	false	true	"q"
11	"d"	false	false	true	"i"
12	" "	true	false	false	" "
13	"1"	false	false	false	"1"
14	"0"	false	false	false	"0"
15	"?"	false	false	false	"?"

output is "Mjqqt btwqi 10?"

test cases

case #	name	inputs	output
1	basic upper case encrypt	"HELLO" ; 3 ; encrypt	"KHOOR"
2	basic lower case encrypt	"hello" ; 3 ; encrypt	"khoor"
3	basic mixed case encrypt	"Hello World ; 5 ; encrypt	"Mjqqt Btwqi"
4	numbers and punctuation	"123!@#" ; 5 ; encrypt	"123!@#"
5	basic upper case decrypt	"KHOOR" ; 3 ; decrypt	"HELLO"
6	basic lower case decrypt	"khoor" ; 3 ; decrypt	"hello"
7	basic mixed case decrypt	"Mjqqt Btwqi" ; 5 ; decrypt	"Hello World"
8	negative key encrypt	"Hello worlD 2024" ; -9 ; encrypt	"Yvccf nficW 2024"
9	negative key decrypt	"Yvccf nficW 2024" ; -9 ; decrypt	"Hello worlD 2024"