UCS 1602 - Compiler Design

Assignment – 1- Lexical Analyser Using C

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Aim:

To write a program to implement Lexical Analyser and stimulate its functionalities in C.

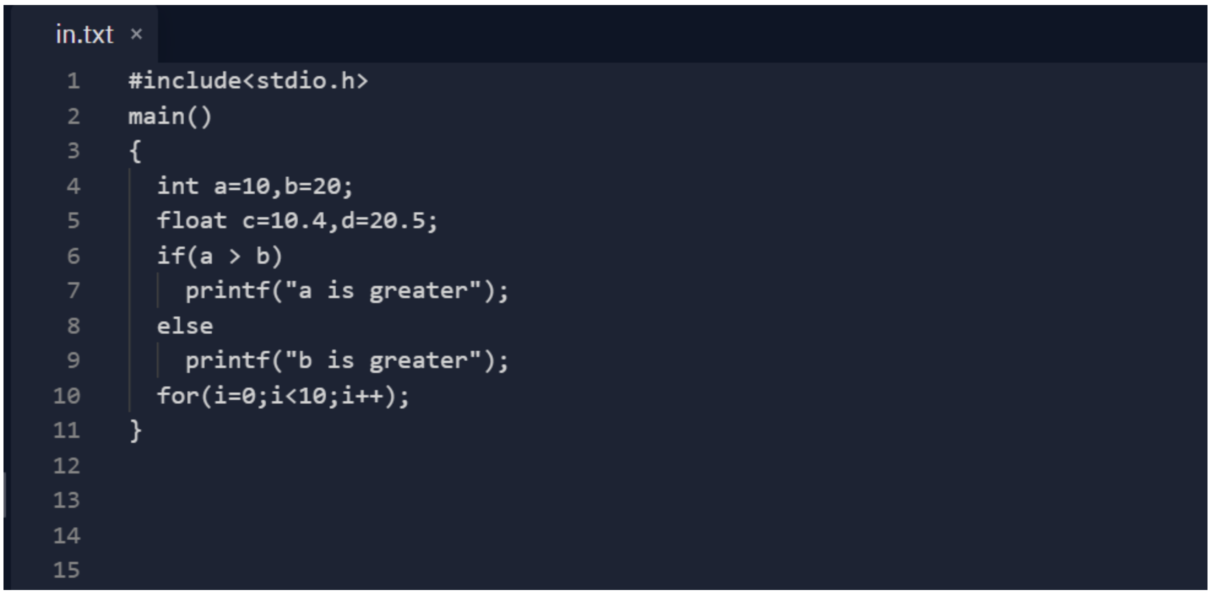
Code:

```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <ctype.h>


char* parse(char *str);
void classify(char *str);
int isKeyword(char *token);
int isIdentifier(char *token);
int isConstant(char *token);
int isRelational(char *token);
int isLogial(char *token);
int isSpecialChar(char c);
int isPPDIR(char *token);
int isAOP(char *token,int id, int len);


int main(void)
{
    char *line = (char*)malloc(sizeof(char)*64);
    FILE *fptr;
    char str[512], file[64];

    fptr = fopen("in.txt", "r");
    while (fgets(str, sizeof(str), fptr))
    {
        line = parse(str);
        classify(line);
    }

    return 0;
}



char* parse(char *str)
{
    int i, len = strlen(str), j = 0;
    char *str1 = (char*)malloc(sizeof(char)*64);
    int flag = 0;

    for (i = 0; i < len; ++i)
    {

        if((str[i] == '+' && str[i + 1] == '+') || (str[i] == '-
' && str[i + 1] == '-') || str[i] == '.')
            continue;

        if ((flag == 0 && str[i] == '"'))
        {
            if (j > 0 && str1[j - 1] != ':')
            {
                str1[j++] = ':';
            }
            str1[j++] = str[i];
            flag = 1;
            continue;
        }

        if (flag)
        {
            str1[j++] = str[i];
            if (str[i] == '"')
            {
                str1[j++] = ':';
                flag = 0;
            }
            continue;
        }

        if (isspace(str[i]))
        {
            str1[j++] = ':';
        }
        else if (!isalnum(str[i]))
        {
            if (j > 0 && str1[j - 1] != ':')
            {
                str1[j++] = ':';
            }
            str1[j++] = str[i];
            str1[j++] = ':';
        }
        else
            str1[j++] = str[i];
    }
    return str1;
}



void classify(char *str)
{
    char *token = (char*)malloc(sizeof(char) * 64);
    char *line = str;
    int c, id = 0;

    char *classifiedAs = (char*)malloc(sizeof(char) * 64);
    strcat(classifiedAs, "");

    int ppdir_flag = 0;
    int index = 0;

    while ((token = strtok_r(line, ":", &line)))
    {
        index++;
        int len = strlen(token);

        if(isPPDIR(token))
        {
          if(ppdir_flag == 0)
          {
            strcat(classifiedAs, "PPDIR");
            ppdir_flag = 1;
          }
          continue;
        }
        else if (ppdir_flag == 1 && (index == 2 || index == 3 || index == 4 ||
 index == 5))
        {
            continue;
        }
        else if (isKeyword(token))
        {
            strcat(classifiedAs, "KW ");
        }
        else if (isIdentifier(token))
        {
            id = 1;
            strcat(classifiedAs, "ID ");
        }
        else if (strcmp(token,"=") == 0)
        {
            strcat(classifiedAs, "ASSIGN ");
        }
        else if ((c = isConstant(token)))
        {
            if (c == 1)
                strcat(classifiedAs, "NUMCONST ");
            else if (c == 2)
                strcat(classifiedAs, "CHARCONST ");
            else if (c == 3)
                strcat(classifiedAs, "STRCONST ");
        }
        else if ((c = isRelational(token)))
        {
            if (c == 1)
                strcat(classifiedAs, "EQ ");
            else if (c == 2)
                strcat(classifiedAs, "GE ");
            else if (c == 3)
                strcat(classifiedAs, "LE ");
            else if (c == 4)
                strcat(classifiedAs, "GT ");
            else if (c == 5)
                strcat(classifiedAs, "LT ");
        }
        else if (isLogical(token))
        {
            strcat(classifiedAs, "LOGOP ");
        }
        else if (isAOP(token,id,len))
        {
            strcat(classifiedAs, "AOP ");
        }
```

```c
        else if (id == 1 && token[0] == '(')
        {
            int len = strlen(classifiedAs);
            classifiedAs[len - 3] = 'F';
            classifiedAs[len - 2] = 'C';
            classifiedAs[len - 1] = '\0';
            strcat(classifiedAs, " SP ");
        }
        else if (isSpecialChar(token[0]))
        {
            strcat(classifiedAs, "SP ");
        }
    }
    printf("%s\n", classifiedAs);
    return;
}
int isKeyword(char *token)
{
    int i;

    char keywords[][32] = {"int", "char", "float",
    "if", "else", "for", "do", "while","void"};

    for (i = 0; i < 32; ++i)
    {
        if (strcmp(token, keywords[i]) == 0)
            return 1;
    }

    return 0;
}

int isIdentifier(char *token)
{
    if (!isalpha(token[0]))
      return 0;
    return 1;
}

int isConstant(char *token)
{
    int i = 0;
    int constant = -1;
    int len = strlen(token);
    int decimal_pt = 0;
    // NUMCONST
    for (i = 0; i < len && decimal_pt < 2; ++i)
    {
        if (token[i] == '.')
        {
            decimal_pt++;
            continue;
        }

        if (!isdigit(token[i]))
        {
            return 0;
        }
    }

    // STRCONST
    if (token[0] == '"' && token[len - 1] == '"')
        return 3;

    // CHARCONST
    if (token[0] == '\'' && token[len - 1] == '\'' && len == 3)
        return 2;

    return 1;
}

int isRelational(char *token)
{
  if (strcmp(token,"==") == 0 )
    return 1;
  else if (strcmp(token,">=") == 0)
    return 2;
  else if(strcmp(token,"<=") == 0)
    return 3;
  else if(strcmp(token,">") == 0)
    return 4;
  else if(strcmp(token,"<") == 0)
    return 5;
  return 0; //not a relop
}

int isLogical(char *token)
{
  if (token[0] == '!' || strcmp(token,"&&") == 0 || strcmp(token,"||") == 0)
    return 1;
  return 0;
}
```

```c
int isSpecialChar(char c)
{
    char sp[10]={'{','[','}',']',';',':',',','(',')'};
    for(int i=0;i<9;i++)
    {
        if(sp[i]==c)
            return 1;
    }
    return 0;
}

int isPPDIR(char *token)
{
  if (strcmp(token,"#") == 0 || strcmp(token,"include") == 0 || strcmp(token,"
<:studioh:>") == 0)
    return 1;
  return 0;
}

int isAOP(char *token,int id,int len)
{
  if ((strcmp(token,"++") == 0 || strcmp(token,"--
") == 0 ) || (len == 1 && (token[0] == '+' || token[0] == '-
' || (id == 1 && token[0] == '*') || token[0] == '/')))
    return 1;
  return 0;
}
```

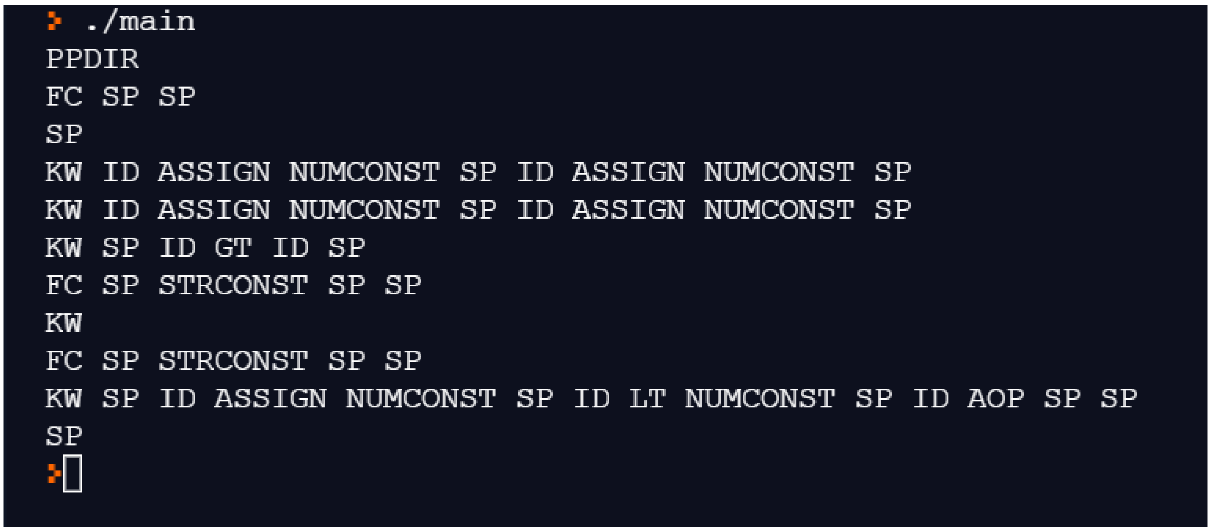
INPUT TEXT FILE TO PARSE (in.txt):



in.txt ×

```
#include<stdio.h>
main()
{
  int a=10,b=20;
  float c=10.4,d=20.5;
  if(a > b)
    printf("a is greater");
  else
    printf("b is greater");
  for(i=0;i<10;i++);
}
```

OUTPUT:



```
 ./main
PPDIR
FC SP SP
SP
KW ID ASSIGN NUMCONST SP ID ASSIGN NUMCONST SP
KW ID ASSIGN NUMCONST SP ID ASSIGN NUMCONST SP
KW SP ID GT ID SP
FC SP STRCONST SP SP
KW
FC SP STRCONST SP SP
KW SP ID ASSIGN NUMCONST SP ID LT NUMCONST SP ID AOP SP SP
SP
```