READ ME

I. Description

This program is a image wrapping tool which can be used to implement several kinds of affine warp including translation, rotation, scaling, shearing and twirling.
The program includes 4 files, which are 'my.h', 'warper.cpp', 'Makefile', and 'README.pdf'.
To compile on linux, use the Makefile that is included in the folder of this program.

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2. Data Structure And Methods

1). Object-Oriented Data Structure
In this program, a class is built for image. The class includes the basic information and some manipulation functions of the image.

Class Name: MyImage
Basic Information:

```
char *filename;
int    height;
int    width;
int    channel;
int    ochannel;
int    oheight;
int    owidth;
float* data;
float* originaldata;
```

Manipulation Functions:

```
void    SetFilename(char *newname){ filename = newname;}
void    SetOriginalData ();
void    ImageRead();
void    ImageWrite(char *);
float*  ImageGetData(){ return data; }
float*  GetOriginalData(){ return originaldata; }
int     GetHeight(){ return height; }
int     GetOHeight(){ return height; }
int     GetWidth(){ return width; }
int     GetOWidth(){ return owidth; }
int     GetChannel(){ return channel; }
int     GetOChannel(){return ochannel;}
char*   GetFilename(){ return filename; }
void    SetHeight( int seth ){ height = seth; }
void    SetWidth( int setw ){ width = setw; }
void    SetData( float* newdata){data = newdata;}
void    SetOHeight( int seth ){ oheight = seth; }
void    SetOWidth( int setw ){ owidth = setw; }
void    SetOChannel( int setc ){ ochannel = setc; }
void    SetChannel( int setc ){ channel = setc; }
void    ImageDisplay();
```

3. Introduction of Functions

1. Functions in file 'my.h'

```
void    SetFilename(char *newname){ filename = newname;}
void    SetOriginalData ();
void    ImageRead();
void    ImageWrite(char *);
float*  ImageGetData(){ return data; }
float*  GetOriginalData(){ return originaldata; }
```

```
int       GetHeight(){ return height; }
int       GetOHeight(){ return height; }
int       GetWidth(){ return width; }
int       GetOWidth(){ return owidth; }
int       GetChannel(){ return channel; }
int       GetOChannel(){return ochannel;}
char*     GetFilename(){ return filename; }
void      SetHeight( int seth ){ height = seth; }
void      SetWidth( int setw ){ width = setw; }
void      SetData( float* newdata){data = newdata;}
void      SetOHeight( int seth ){ oheight = seth; }
void      SetOWidth( int setw ){ owidth = setw; }
void      SetOChannel( int setc ){ ochannel = setc; }
void      SetChannel( int setc ){ channel = setc; }
void      ImageDisplay();
```

2. Function in file 'warper.cpp'

```
void    RenderScene()
void    lowercase(char *)
void    Rotate(Matrix3x3, float)
void    Translation(Matrix3x3, float, float)
void    Shear(Matrix3x3, float, float)
void    Scale(Matrix3x3, float, float)
void    Twirl(float, float, float)
void    Transform(float*, int, int, int, int, int, int, int, float*, Matrix3x3)
void    process_input(Matrix3x3)
void    handleKey( unsigned char key, int x, int y )
```

4. User Instructions

1). Command Line Arguments

This program is able to accept 2 command line parameters. The first one is input image name, which is required. The second one is file name to write the image,

which is optional. When a write filename is not specified, users are not allowed to write the image.
Usage: ./warper [input filename]([writename]).

2). Keyboard Manipulation

I. Affine Warp

r	θ	counter clockwise rotation about image origin, θ in degrees
s	sx sy	scale
t	dx dy	translate
h	hx hy	shear
n	s cx xy	nonlinear twirl warp

II. Press 'w' or 'W' to write the displaying image as the file name of the second argument.

III. Press 'q' or 'Q' to quit the program.