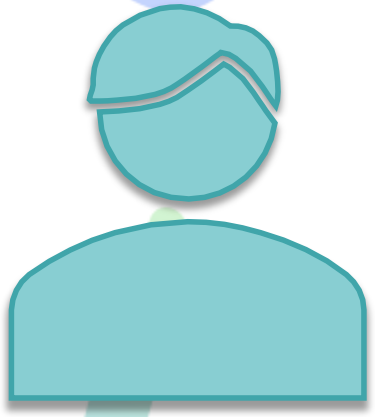
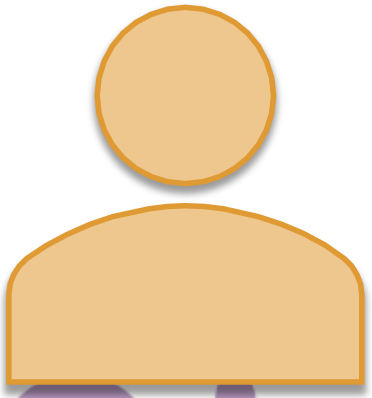

We are NervCode

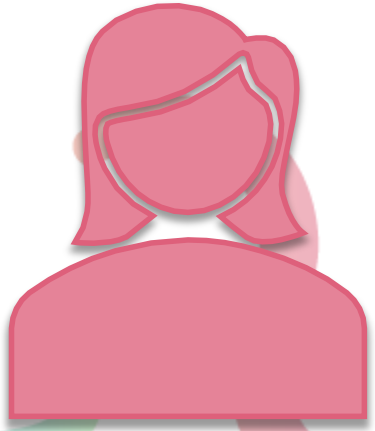
nc



Andres David



Jean Pierre



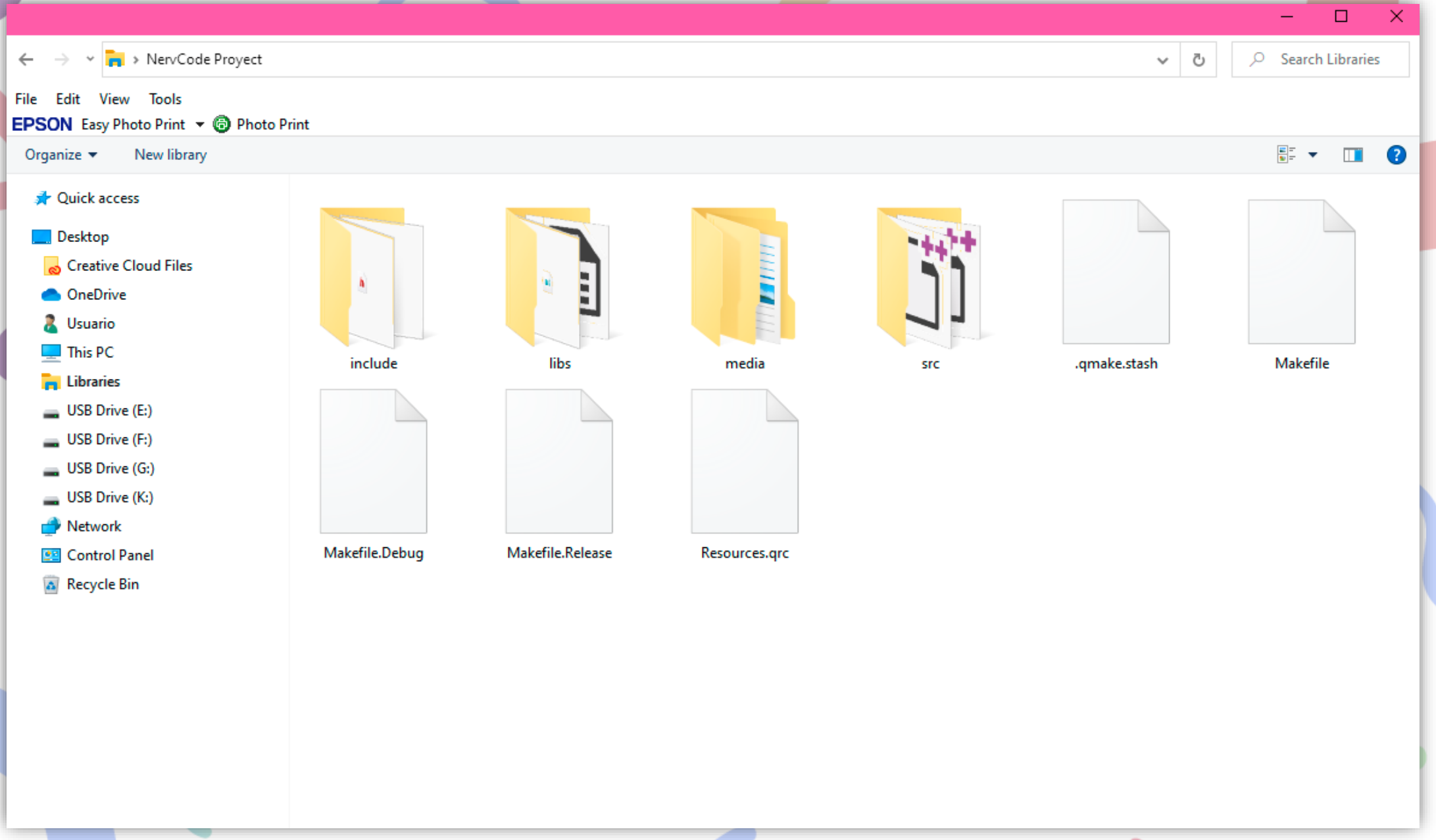
Ingrid

Jhan Alejandro

Proyecto Final IPOO

Panorama

- Elaboración de un programa capaz de aplicar filtros a imágenes .ppm y .pgm .Para la cual se utilizaron las herramientas aprendidas en clase de programación orientada objetos y utilizando QT creator para crear la interfaz.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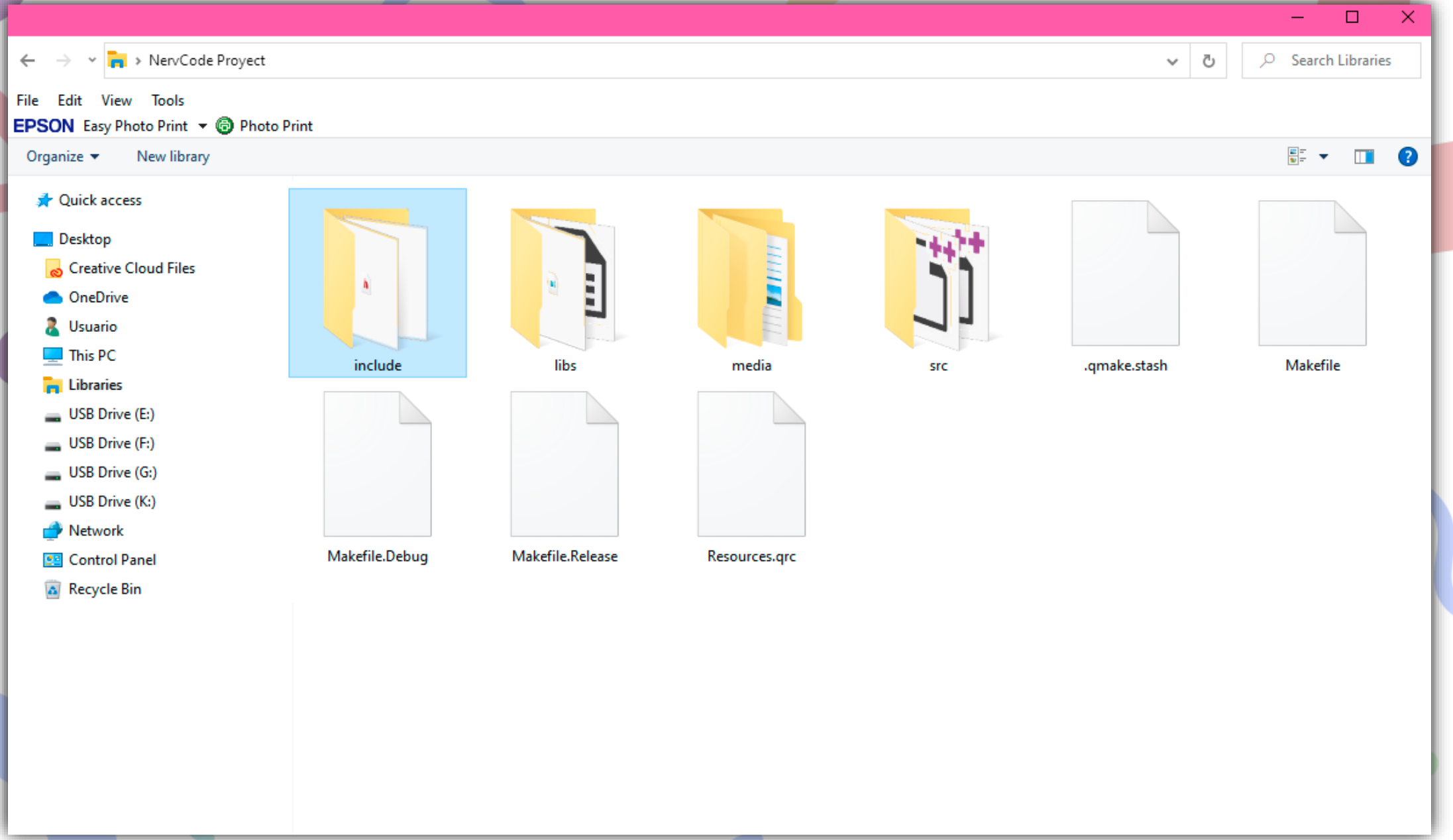
USB Drive (K:)
Network
Control Panel
Recycle Bin
include
libs
media
src
.qmake.stash
Makefile
Makefile.Debug
Makefile.Release
Resources.qrc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Recycle Bin
include
libs
media
src
.qmake.stash
Makefile
Makefile.Debug
Makefile.Release
Resources.qrc

Herencia multinivel

Class Image

Protected
- int rows;
- int columns;
- int maxRGB
- string name;

Public
- Image()
- Image(string fileName);
- ~Image();
- int getRows();
- int getColumns();
- int getMaxRGB();
- string getName();

Class File : Public Filters

Private
- string name;
- int width;
- int height;
- string header;
- int matrixStart;
- int maxIntensity;

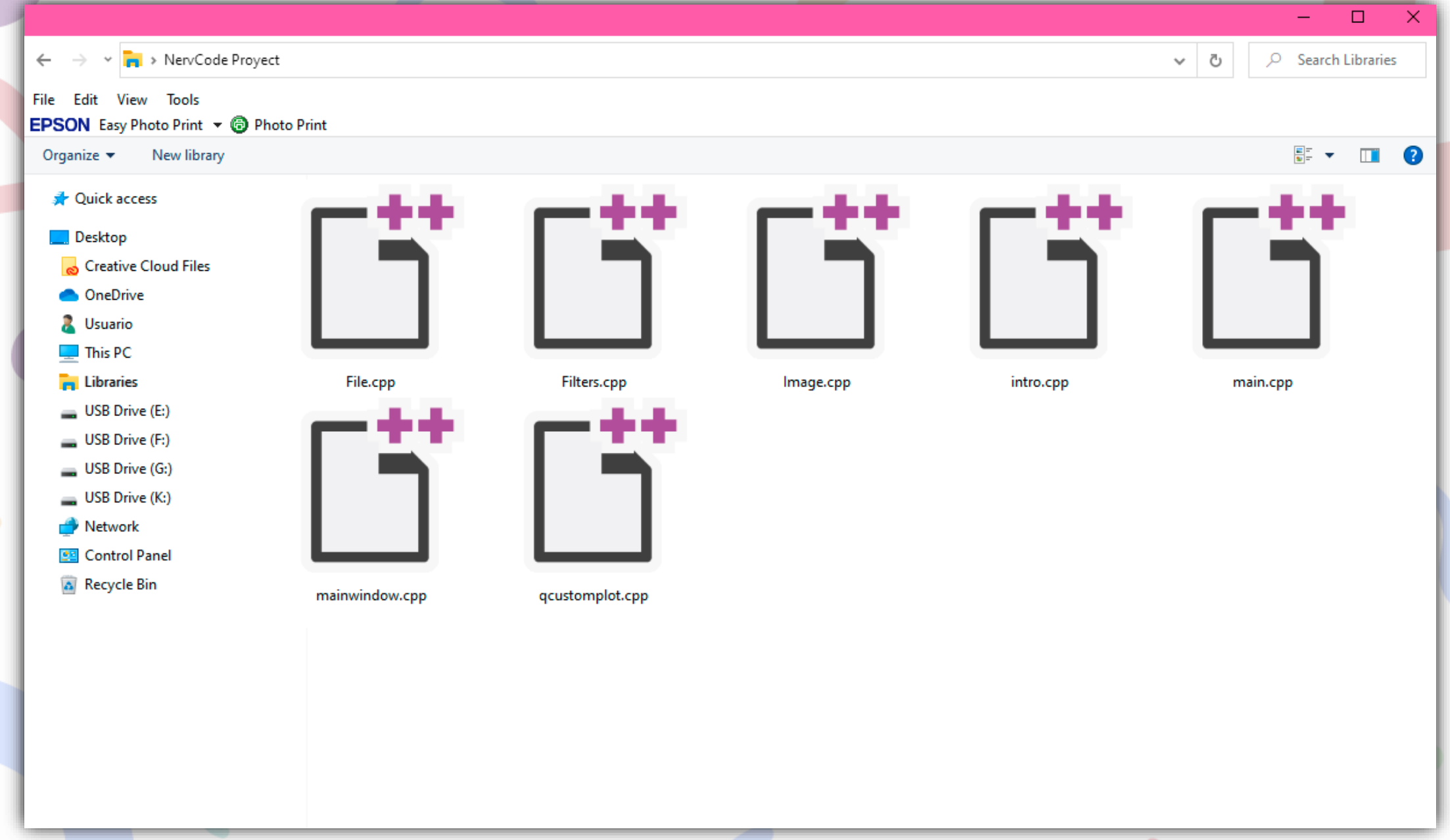
Protected
- vector<vector<int>> picture;
- vector<vector<int>> filtered;
- string extension;

Public
- File();
- File(string fileName);
- ~File();
- void readFile();
- void getFileValues();
- void writeFile(string fileName);
- void convertToVector();
- vector<vector<int>> getPicture();
- void setFiltered(vector<vector<int>> fromFilters);
- string getExtension();
- QVector<double> histogram();
- int getmaxIntensity();

Class Filters : Public File

Private
- string newFileName;
- int rgbCounter;
- int filter;
- vector<vector<int>> image;
- vector<vector<int>> secondImage;
- vector<vector<int>> copyImg;
- int maxRGB;
- bool isGrey;

Public
- Filters();
- Filters(File &obj, int filter, int value=0);
- Filters(File &obj, File &obj2);
- ~Filters();
- vector<vector<int>> getFiltered();
- void normal();
- bool isBlacknWhite();
- void threshold();
- void flip();
- void toGrey();
- void toNegative();
- void toSephia();
- void toTone(int color);
- void toColor();
- void overLay();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File.cpp
Filters.cpp
Image.cpp
intro.cpp
main.cpp
mainwindow.cpp
qcustomplot.cpp

Images.cpp

```cpp
Image::Image(){
    this->rows = 0;
    this->columns = 0;
    this->maxRGB = 0;
    this->name = " ";
}

Image::Image(string fileName){
    this->rows = 0;
    this->columns = 0;
    this->maxRGB = 0;
    this->name = fileName;
}
```

```cpp
int Image::getMaxRGB()
{
    return maxRGB;
}

string Image::getName()
{
    return this->name;
}
```

```cpp
Image::~Image(){}

int Image::getRows(){
    return rows;
}

int Image::getColumns()
{
    return columns;
}
```

File.cpp

```cpp
void File::readFile()
{
    ifstream imageFile;
    string line;
    imageFile.open(this->name, ios::in);
    if(imageFile.fail())
    {
        cout << "File couldn't be openend" << endl;
        exit(1);
    }
    while(!imageFile.eof())
    {
        getline(imageFile, line);
        cout << line << endl;
    }
    imageFile.close();
}
```

```cpp
void File::getFileValues()
{
    ifstream imageFile;
    string line;
    imageFile.open(this->name, ios::in);
    while(getline(imageFile,line))
    {
        rows++;
        if(rows == 1 && line[0] == 'P')
        {
            this->header = line;
        }
        if(rows == 2 && line[0] != '#' && !line.empty())
        {
            this->width = stod(line.substr(0, line.find(" ")+1));
            this->height = stod(line.substr(line.find(" ")+1,line.length()));
        }
        if(rows == 3)
        {
            if(line.length() <= 3)
            {
                maxRGB = stod(line);
                matrixStart = 3;
            }
            else
            {
                this->width = stod(line.substr(0, line.find(" ")+1));
                this->height = stod(line.substr(line.find(" ")+1,line.length()));
            }
        }
        if(rows == 4 && line.length() <=3)
        {
            maxRGB = stod(line);
            matrixStart = 4;
        }
        int lineLenght = line.length();
        for(int i=0; i<lineLenght; i++)
        {
            if(line[i] == ' ')
            {
                this->columns++;
            }
        }
    }
    this->rows = this->rows - matrixStart;
}
```

```
void File::writeFile(string fileName)
{
    QString tempPath = QDir::tempPath();
    QString extension = QString::fromStdString(this->extension);
    QString temporaryFile = tempPath +  "FilteredImage" + extension;
    ofstream newImageFile;
    if(fileName.length()>25){
        newImageFile.open(fileName, ios::out);
    }else
    {
        newImageFile.open(temporaryFile.toUtf8().constData(), ios::out);
    }
    if(newImageFile.fail())
    {
        cout << "Error could not open archive" <<  endl;
        exit(1);
    }

    newImageFile << this->header << endl;
    newImageFile << "#NervCode" << endl;
    newImageFile << this->width << " " << this->height << endl;
    newImageFile << maxRGB << endl;
    int filterSize = this->filtered.size();
    for(int i=0; i < filterSize; i++)
    {
        int columnSize = this->filtered[i].size();
        for(int j=0; j<columnSize; j++)
        {
            newImageFile << this->filtered[i][j] << " ";
        }
        newImageFile << endl;
    }
    newImageFile.close();
}
```

```
void File::convertToVector()
{
    ifstream imageFile;
    imageFile.open(this->name, ios::in);
    string line;
    for (int i = 0; i < this->rows + matrixStart; i++)
    {
        vector<int> row;
        string line;
        getline(imageFile, line);
        stringstream spliter(line);
        string columnValue;
        if (i >= 4)
        {
            while (getline(spliter, columnValue, ' '))
            {
                int values = stoi(columnValue);
                row.push_back(values);
            }
            picture.push_back(row);
        }
    }
}
```

```
QVector<double> File::histogram()
{
    int valueIntensity = 0;
    QVector<double> histogram(255);

    while(valueIntensity < 255)
    {
        int counter = 0;
        int imageSize = this->picture.size();
        for(int rows = 0; rows<imageSize; rows++)
        {
            int columnsSize = this->picture[rows].size();
            for(int columns = 0; columns < columnsSize; columns++)
            {
                if(this->picture[rows][columns] == valueIntensity)
                {
                    counter ++;
                }

            }
        }
        if(counter > this->maxIntensity)
        {
            this->maxIntensity = counter;
        }
        valueIntensity = valueIntensity + 1;
        histogram[valueIntensity] = counter;
    }
    return histogram;
```

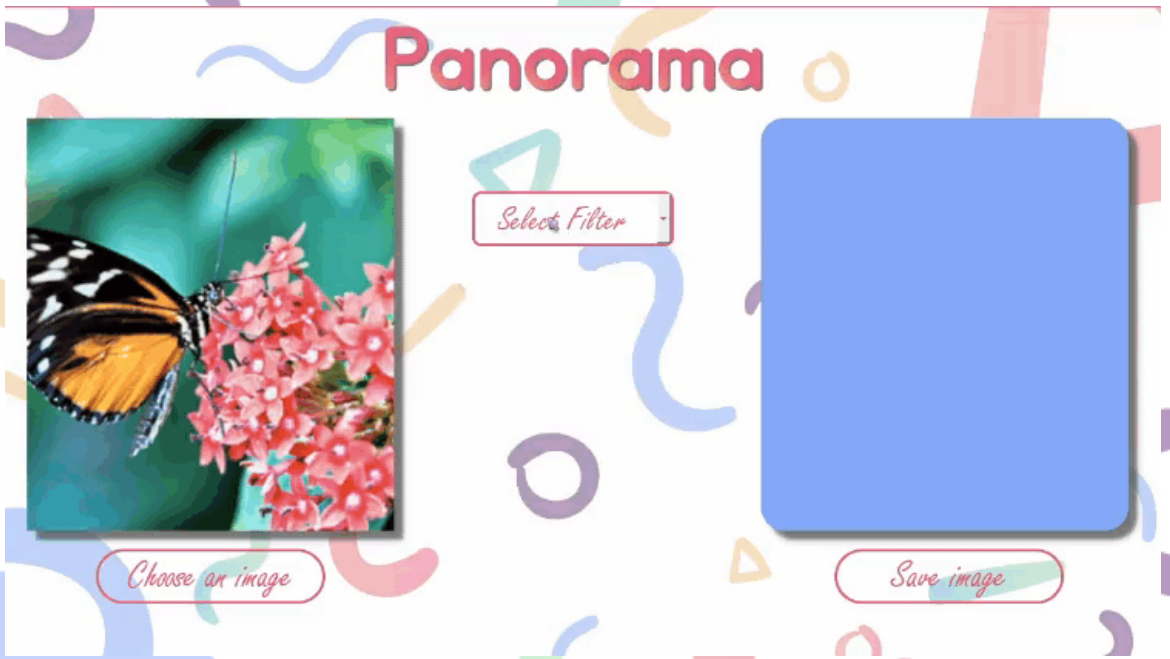
Filters.cpp

```cpp
Filters::Filters(File &obj, int filter, int value)
{
    this->image = obj.getPicture();
    this->copyImg = this->image;
    this->maxRGB = obj.getMaxRGB();
    this->rgbCounter=0;
    this->isGrey = false;
    this->isBlacknWhite();
    switch (filter)
    {
    case 1:
        this->normal();
        break;
    case 2:
        this->toGrey();
        break;
    case 3:
        this->toNegative();
        break;
    case 4:
        this->toSephia();
        break;
    case 5:
        this->toTone(value);
        break;
    case 6:
        this->flip();
        break;
    case 7:
        this->toColor();
        break;
    case 8:
        this->threshold();
        break;
    default:
        break;
    }
}
```

Black and White

```
void Filters::toGrey()
{
    int imageSize = this->image.size();
    for(int i=0; i<imageSize; i++)
    {
        int columnsSize =this->image[i].size();
        for(int j=0; j<columnsSize; j++)
        {
            int red = this->image[i][j];
            int green = this->image[i][j+1];
            int blue = this->image[i][j+2];
            int gray = 0.2989 * red + 0.5870 * green + 0.1140 * blue;
            this->image[i][j] = gray;
            this->image[i][j+1] = gray;
            this->image[i][j+2] = gray;
            j = j + 2;
        }
    }
}
```

Sepia




```
void Filters::toSepia()
{
    int imageSize = this->image.size();
    for(int i=0; i<imageSize; i++)
    {
        int columnsSize =this->image[i].size();
        for(int j=0; j<columnsSize; j++)
        {
            int red = this->image[i][j];
            int green = this->image[i][j+1];
            int blue = this->image[i][j+2];
            int tr = 0.393 *red+ 0.769 *green+ 0.189 *blue;
            if (tr >= maxRGB)
            {
                tr = maxRGB;
            }
            int tg = 0.349 *red+ 0.686 *green+ 0.168 *blue;
            if (tg >= maxRGB)
            {
                tg = maxRGB;
            }
            int tb = 0.272 *red+ 0.534 *green+ 0.131 *blue;
            if (tb >= maxRGB)
            {
                tb = maxRGB;
            }
            this->image[i][j] = tr;
            this->image[i][j+1] = tg;
            this->image[i][j+2] = tb;
            j = j + 2;
        }
    }
}
```

```
void Filters::toNegative(){
    int imageSize = this->image.size();
    for(int i=0; i<imageSize; i++)
    {
        int columnsSize =this->image[i].size();
        for(int j=0; j<columnsSize; j++)
        {
            if(this->image[i][j] == 0)
            {
                this->image[i][j] = maxRGB;
            }
            else if(this->image[i][j] == maxRGB)
            {
                this->image[i][j] = 0;
            }
            else
            {
                int negative = maxRGB - this->image[i][j];
                this->image[i][j] = negative;
            }
        }
    }
}
```

Negative

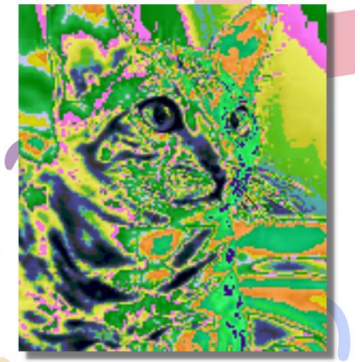
Tone
Tone
Tone

```cpp
void Filters::toTone(int color)
{

  vector<vector<int>> colorTone = {{0,0,0},{91, -99, -14}, {-115, -86, -23},{-72,75,-77}};
  int imageSize = this->image.size();
  for (int i = 0; i < imageSize; i++)
  {
    int columnsSize =this->image[i].size();
    for (int j = 0; j < columnsSize; j++)
    {
      int red = this->image[i][j];
      int green = this->image[i][j + 1];
      int blue = this->image[i][j + 2];

      int toneR = colorTone[color][0] + red;
      int toneG = colorTone[color][1] + green;
      int toneB = colorTone[color][2] + blue;

      if (toneR <= 0)
        toneR = 0;
      if (toneR >= 255)
        toneR = 255;
      if (toneG <= 0)
        toneG = 0;
      if (toneG >= 255)
        toneG = 255;
      if (toneB <= 0)
        toneB = 0;
      if (toneB >= 255)
        toneB = 255;
      this->image[i][j] = toneR;
      this->image[i][j+1] = toneG;
      this->image[i][j+2] = toneB;
      j = j + 2;
    }
  }
}
```

To Color

Panorama

ToColor



Choose an image

Filter applied!

Save image

```
void Filters::toColor(){
    if(this->isGrey){
        int imageSize = this->image.size();
        for (int rows = 0; rows < imageSize; rows++)
        {
            int columnsSize =this->image[rows].size();
            for (int columns = 0; columns < columnsSize; columns++)
            {
                int r = copyImg[rows][columns]/50;
                int g = copyImg[rows][columns + 1]/40;
                int b = copyImg[rows][columns + 2]/30;
                this->image[rows][columns] = copyImg[rows][columns]*r;
                this->image[rows][columns+1] = copyImg[rows][columns+1]*g;
                this->image[rows][columns+2] = copyImg[rows][columns+2]*b;
                columns = columns+2;
            }
        }
    }
    else
    {

    }
}
```

```
void Filters::threshold()
{
    int largest = 0;
    int imageRows = this->image.size();
    for(int rows = 0; rows < imageRows; rows++)
    {
        int imageColumns = this->image[rows].size();
        for(int columns = 0; columns < imageColumns; columns++)
        {
            int red = this->image[rows][columns];
            int green = this->image[rows][columns+1];
            int blue = this->image[rows][columns+2];

            if(red > green && red > blue){
                largest = red;
            }else if(green > red && green > blue){
                largest = green;

            }else if(blue > red && blue > green){
                largest = blue;

            }else if(red == green || red == blue || green == blue){
                largest = red;
            }

            if(largest>127)
            {
                this->image[rows][columns] = 255;
                this->image[rows][columns+1] = 255;
                this->image[rows][columns+2] = 255;
            }
            else
            {
                this->image[rows][columns] = 0;
                this->image[rows][columns+1] = 0;
                this->image[rows][columns+2] = 0;
            }

            columns = columns + 2;
        }
    }
}
```

Threshold

Panorama

Flip

Choose an image

Filter applied!

Save image

Flip

```
void Filters::flip()
{
    int imageRows = this->image.size();
    for(int rows = 0; rows < imageRows; rows++)
    {
        int imageColumns =  this->image[rows].size();
        for(int columns = 0; columns < imageColumns; columns++ )
        {
            int red = copyImg[rows][imageColumns - 3 - columns];
            int green = copyImg[rows][imageColumns - 2 - columns];
            int blue = copyImg[rows][imageColumns - 1 - columns];
            this->image[imageRows-1-rows][columns] = red;
            this->image[imageRows-1-rows][columns+1] = green;
            this->image[imageRows-1-rows][columns+2] = blue;
            columns = columns + 2;
        }
    }
}
```

```
void Filters::overLay(){

    int imageRows = this->image.size();
    for(int rows = 0; rows < imageRows; rows++)
    {
        int secondImgRows = this->secondImage.size();
        if(rows > secondImgRows)
        {
            this->secondImage.push_back(this->image[rows]);
        }
        else
        {

            int imageColumns = this->image[rows].size();
            int secondImgColumns = this->secondImage[rows].size();
            for(int columns = 0; columns < imageColumns; columns++)
            {
                if(columns > secondImgColumns)
                {
                    int greenValue = 0;
                    if(rgbCounter == 0) greenValue = 0;
                    if(rgbCounter == 1) greenValue = 255;
                    if(rgbCounter == 2)
                    {
                        greenValue = 0;
                        rgbCounter = 0;
                    }
                    this->secondImage[rows].push_back(greenValue);
                }
                rgbCounter++;
            }
        }
    }
```

Overlay


```
    for(int rows = 0; rows < imageRows; rows++)
    {
        int imageColumns = this->secondImage[rows].size();
        for(int columns = 0; columns<imageColumns; columns++)
        {
            int red = this->secondImage[rows][columns] ;
            int green = this->secondImage[rows][columns+1];
            int blue = this->secondImage[rows][columns+2];
            if((red != 0 && green != 255 && blue!= 0) || (red == 255 && green == 255 && blue == 255))
            {
                this->image[rows][columns] = this->secondImage[rows][columns];
                this->image[rows][columns+1] = this->secondImage[rows][columns+1];
                this->image[rows][columns+2] = this->secondImage[rows][columns+2];
            }else{

            }
            columns = columns+2;
        }
    }
}
```

Histogram

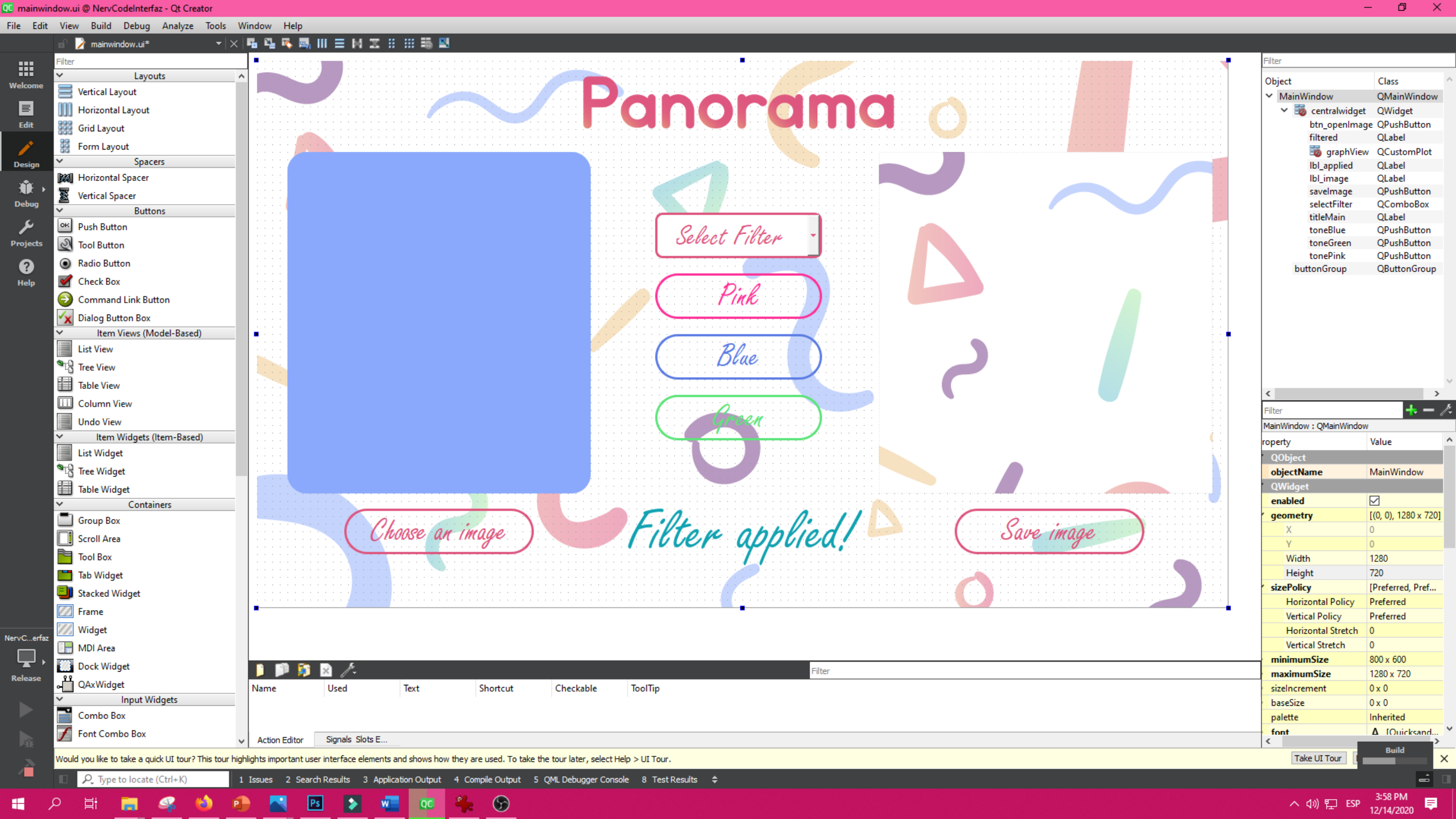
Para la realización de Histogram utilizamos la librería QCustomPlot.

```
void Filters::overLay(){

    int imageRows = this->image.size();
    for(int rows = 0; rows < imageRows; rows++)
    {
        int secondImgRows = this->secondImage.size();
        if(rows > secondImgRows)
        {
            this->secondImage.push_back(this->image[rows]);
        }
        else
        {

            int imageColumns = this->image[rows].size();
            int secondImgColumns = this->secondImage[rows].size();
            for(int columns = 0; columns < imageColumns; columns++)
            {
                if(columns > secondImgColumns)
                {
                    int greenValue = 0;
                    if(rgbCounter == 0) greenValue = 0;
                    if(rgbCounter == 1) greenValue = 255;
                    if(rgbCounter == 2)
                    {
                        greenValue = 0;
                        rgbCounter = 0;
                    }
                    this->secondImage[rows].push_back(greenValue);
                }
                rgbCounter++;
            }
        }
    }
```

```
    for(int rows = 0; rows < imageRows; rows++)
    {
        int imageColumns = this->secondImage[rows].size();
        for(int columns = 0; columns<imageColumns; columns++)
        {
            int red = this->secondImage[rows][columns] ;
            int green = this->secondImage[rows][columns+1];
            int blue = this->secondImage[rows][columns+2];
            if((red != 0 && green != 255 && blue!= 0) || (red == 255 && green == 255 && blue == 255))
            {
                this->image[rows][columns] = this->secondImage[rows][columns];
                this->image[rows][columns+1] = this->secondImage[rows][columns+1];
                this->image[rows][columns+2] = this->secondImage[rows][columns+2];
            }else{

            }
            columns = columns+2;
        }
    }
}
```

```
else if(arg1 == "Overlay")
{
    //Only show add second image and not tone bottons
    ui->openImage2->setVisible(true);

    QGraphicsOpacityEffect *effBtnImage2 = new QGraphicsOpacityEffect(ui->openImage2);
    ui->openImage2->setGraphicsEffect(effBtnImage2);

    QPropertyAnimation *animationAppearPink = new QPropertyAnimation(effBtnImage2, "opacity");
    animationAppearPink->setDuration(500);
    animationAppearPink->setStartValue(0.0);
    animationAppearPink->setEndValue(1.0);
    animationAppearPink->start();

    ui->tonePink->setVisible(false);
    ui->toneBlue->setVisible(false);
    ui->toneGreen->setVisible(false);
    ui->graphView->setVisible(false);
    ui->filtered->setVisible(true);
    ui->saveImage->setVisible(true);
    if(secondImg != " ")
    {
        string secondImgDir = secondImg.toUtf8().constData();
        File *secondImg = new File(secondImgDir);
        Filters apply(*newImage,*secondImg);
        newImage->setFiltered(apply.getFiltered());
        if(save == 1){
            newImage->writeFile(saveImgDir);
            QFile file(temporaryFilePath);
            file.remove();
        }else{
            newImage->writeFile(temporaryFile.toUtf8().constData());
        }
    }
}
```

Qt (pronunciado “cute” en ingles) es un conjunto de herramientas de widgets gratuito y de código abierto para crear interfaces gráficas de usuario.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File Edit View Build Debug Analyze Tools Window Help
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Filter
Layouts
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Horizontal Layout
Grid Layout
Form Layout
Spacers
Horizontal Spacer
Vertical Spacer
Buttons
Push Button
Tool Button
Radio Button
Check Box
Command Link Button
Dialog Button Box
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Undo View
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Table Widget
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Input Widgets
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X
0
Y
0
Width
1280
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Preferred
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Preferred
Horizontal Stretch
0
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0
minimumSize
800 x 600
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0 x 0
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palette
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[Quicksand...
Would you like to take a quick UI tour? This tour highlights important user interface elements and shows how they are used. To take the tour later, select Help > UI Tour.
Take UI Tour
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ESP
3:58 PM
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mainwindow.cpp @ NervCodeInterfaz - Qt Creator

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Projects | mainwindow.cpp | MainWindow::on_selectFilter_activated(const QString &, int) -> void | Windows (CRLF) | Line: 361, Col: 10

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NervC...erfaz
Release

```
133
134
135
136 void MainWindow::on_selectFilter_activated(const QString &arg1,int save)
137 {
138     QImage image;
139     QString tempPath = QDir::tempPath();
140     string imageDir = filename.toUtf8().constData();
141     QString extension = QString::fromStdString(imageDir.substr(imageDir.find("."), imageDir.length()));
142     QString temporaryFile = "FilteredImage"+extension;
143     QString temporaryFilePath = tempPath +  temporaryFile;
144     File *newImage = new File(imageDir);
145     lastFilter = arg1;
146     if(arg1 == "Select Filter")
147     {
148         ui->tonePink->setVisible(false);
149         ui->toneBlue->setVisible(false);
150         ui->toneGreen->setVisible(false);
151         ui->openImage2->setVisible(false);
152         ui->graphView->setVisible(false);
153         ui->filtered->setVisible(true);
154         ui->saveImage->setVisible(true);
155         Filters apply(*newImage,1);
156         newImage->setFiltered(apply.getFiltered());
157         if(save == 1){
158             newImage->writeFile(saveImgDir);
159             QFile file(temporaryFilePath);
160             file.remove();
161         }else{
162             newImage->writeFile(temporaryFile.toUtf8().constData());
163         }
164     }
165     if(arg1 == "BlacknWhite")
166     {
167         ui->tonePink->setVisible(false);
168         ui->toneBlue->setVisible(false);
169         ui->toneGreen->setVisible(false);
170         ui->openImage2->setVisible(false);
171         ui->graphView->setVisible(false);
172         ui->lbl_applied->setVisible(true);
173         ui->lbl_applied->setText("Filter applied!");
174         ui->filtered->setVisible(true);
175         ui->saveImage->setVisible(true);
176         Filters apply(*newImage,2);
177         newImage->setFiltered(apply.getFiltered());
178         if(save == 1){
179             newImage->writeFile(saveImgDir);
180             QFile file(temporaryFilePath);
```

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¡Probemos el programa!