

```
// Yannique Hecht
// HARVARD CS50 Week 4 - Filter - Implement a program that applies
// filters to BMPs (Grayscale, Reflection, Blur, Edges)
```

```
#include <getopt.h>
#include <stdio.h>
#include <stdlib.h>
```

```
#include "helpers.h"
```

```
[REDACTED]
```

```
    // Define allowable filters
```

```
    [REDACTED]
```

```
    // Get filter flag and check validity
```

```
    [REDACTED]
```

```
    [REDACTED]
```

```
    [REDACTED]
```

```
        [REDACTED]
```

```
        [REDACTED]
```

```
    [REDACTED]
```

```
    // Ensure only one filter
```

```
    [REDACTED]
```

```
    [REDACTED]
```

```
        [REDACTED]
```

```
        [REDACTED]
```

```
    [REDACTED]
```

```
    // Ensure proper usage
```

```
    [REDACTED]
```

```
    [REDACTED]
```

```
        [REDACTED]
```

```
        [REDACTED]
```

```
    [REDACTED]
```

```
    // Remember filenames
```

```
    [REDACTED]
```

```
    [REDACTED]
```

```
    // Open input file
```

```
    [REDACTED]
```

```
    [REDACTED]
```

```
    [REDACTED]
```

```
    [redacted]  
    [redacted]  
[redacted]
```

```
// Open output file
```

```
[redacted]  
[redacted]  
[redacted]  
    [redacted]  
    [redacted]  
    [redacted]  
[redacted]
```

```
// Read infile's BITMAPFILEHEADER
```

```
[redacted]  
[redacted]
```

```
// Read infile's BITMAPINFOHEADER
```

```
[redacted]  
[redacted]
```

```
// Ensure infile is (likely) a 24-bit uncompressed BMP 4.0
```

```
[redacted]
```

```
[redacted]
```

```
    [redacted]  
[redacted]  
    [redacted]  
    [redacted]  
    [redacted]  
    [redacted]  
[redacted]
```

```
[redacted]  
[redacted]
```

```
// Allocate memory for image
```

```
[redacted]  
[redacted]  
[redacted]  
[redacted]  
[redacted]  
    [redacted]  
    [redacted]  
    [redacted]  
    [redacted]  
[redacted]
```

```
// Determine padding for scanlines
```

```
[REDACTED]
```

```
// Iterate over infile's scanlines
```

```
[REDACTED]
```

```
[REDACTED]
```

```
    // Read row into pixel array
```

```
[REDACTED]
```

```
    // Skip over padding
```

```
[REDACTED]
```

```
[REDACTED]
```

```
// Filter image
```

```
[REDACTED]
```

```
[REDACTED]
```

```
    // Blur
```

```
[REDACTED]
```

```
[REDACTED]
```

```
[REDACTED]
```

```
    // Grayscale
```

```
[REDACTED]
```

```
[REDACTED]
```

```
[REDACTED]
```

```
    // Reflection
```

```
[REDACTED]
```

```
[REDACTED]
```

```
[REDACTED]
```

```
    // Sepia
```

```
[REDACTED]
```

```
[REDACTED]
```

```
[REDACTED]
```

```
[REDACTED]
```

```
// Write outfile's BITMAPFILEHEADER
```

```
[REDACTED]
```

```
// Write outfile's BITMAPINFOHEADER
```

```
[REDACTED]
```

```
// Write new pixels to outfile
```

```
[REDACTED]
```

```
[REDACTED]
```

```
        // Write row to outfile
        [REDACTED]

        // Write padding at end of row
        [REDACTED]
        [REDACTED]
        [REDACTED]
        [REDACTED]
        [REDACTED]
        [REDACTED]

        // Free memory for image
        [REDACTED]

        // Close infile
        [REDACTED]

        // Close outfile
        [REDACTED]

        [REDACTED]
    [REDACTED]
```