

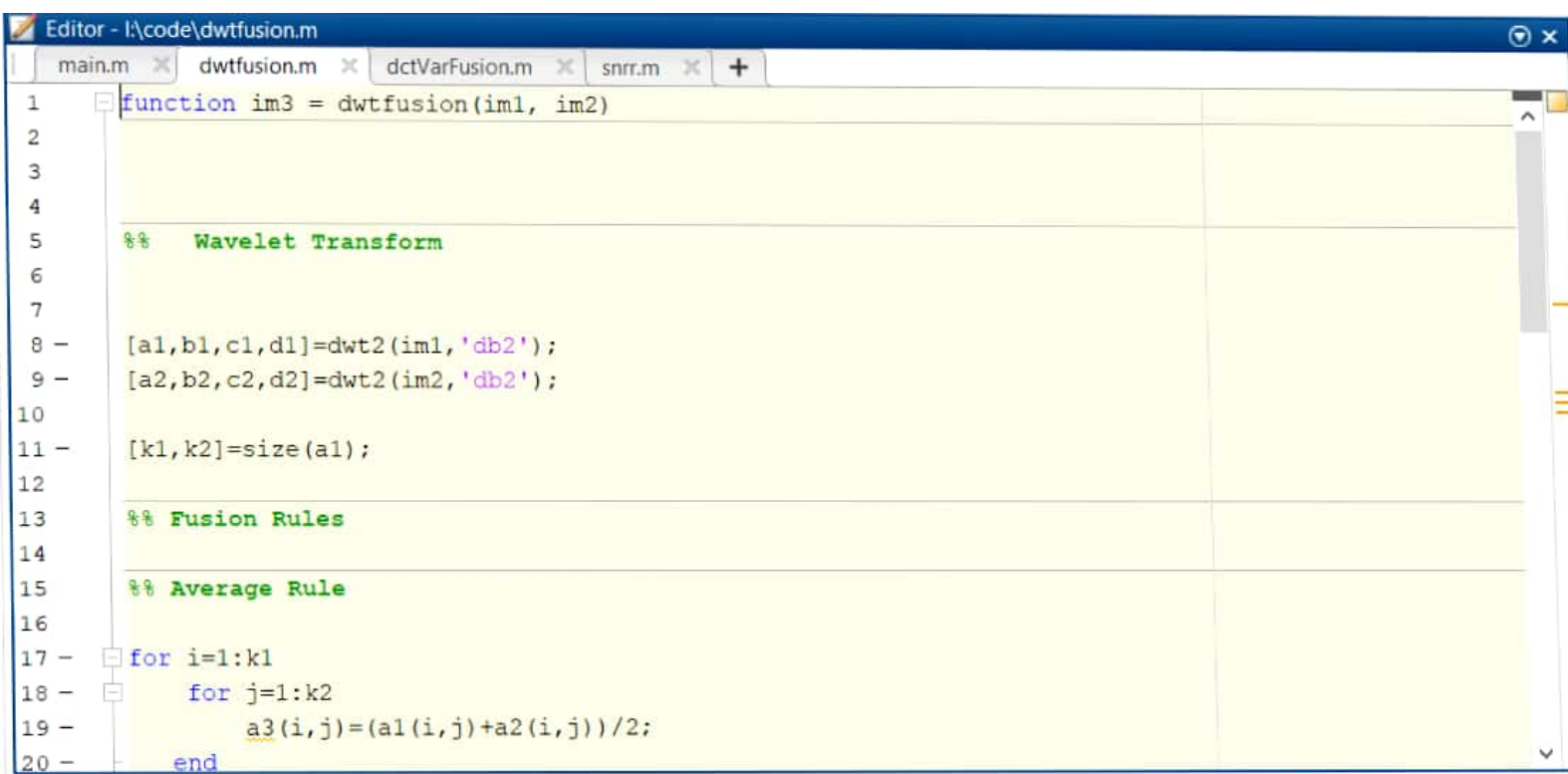


The image shows a MATLAB Editor window with the title bar "Editor - I:\code\main.m". The window contains a script with the following code:

```
1 - close all;
2 - clear;
3 - clc;
4 %% Read Images
5
6 - [file, pathname] = uigetfile('*.jpg','Load Image 1 ');cd(pathname);
7 - im1=imread(file);
8 - [file, pathname] = uigetfile('*.jpg','Load Image 2 ');cd(pathname);
9 - im2=imread(file);
10 - subplot(2,2,1), imshow(im1), title('Source image 1');
11 - subplot(2,2,2), imshow(im2), title('Source image 2');
12
13 - dwtfusion(im1,im2);
14 - dctVarFusion(im1, im2);
15
```

The script performs the following steps:

- Close all open figures.
- Clear the workspace.
- Clear the command window.
- Read two images into the workspace.
- Display the two source images side-by-side in a 2x2 grid.
- Perform DWT fusion on the two images.
- Perform DCT Var Fusion on the two images.



The image shows a MATLAB Editor window with the title bar "Editor - I:\code\dwtfusion.m". The window contains a script named dwtfusion.m, which is the active tab. Other tabs visible are main.m, dctVarFusion.m, and snrr.m. The script dwtfusion.m is a function that takes two inputs, im1 and im2, and returns im3. The script is as follows:

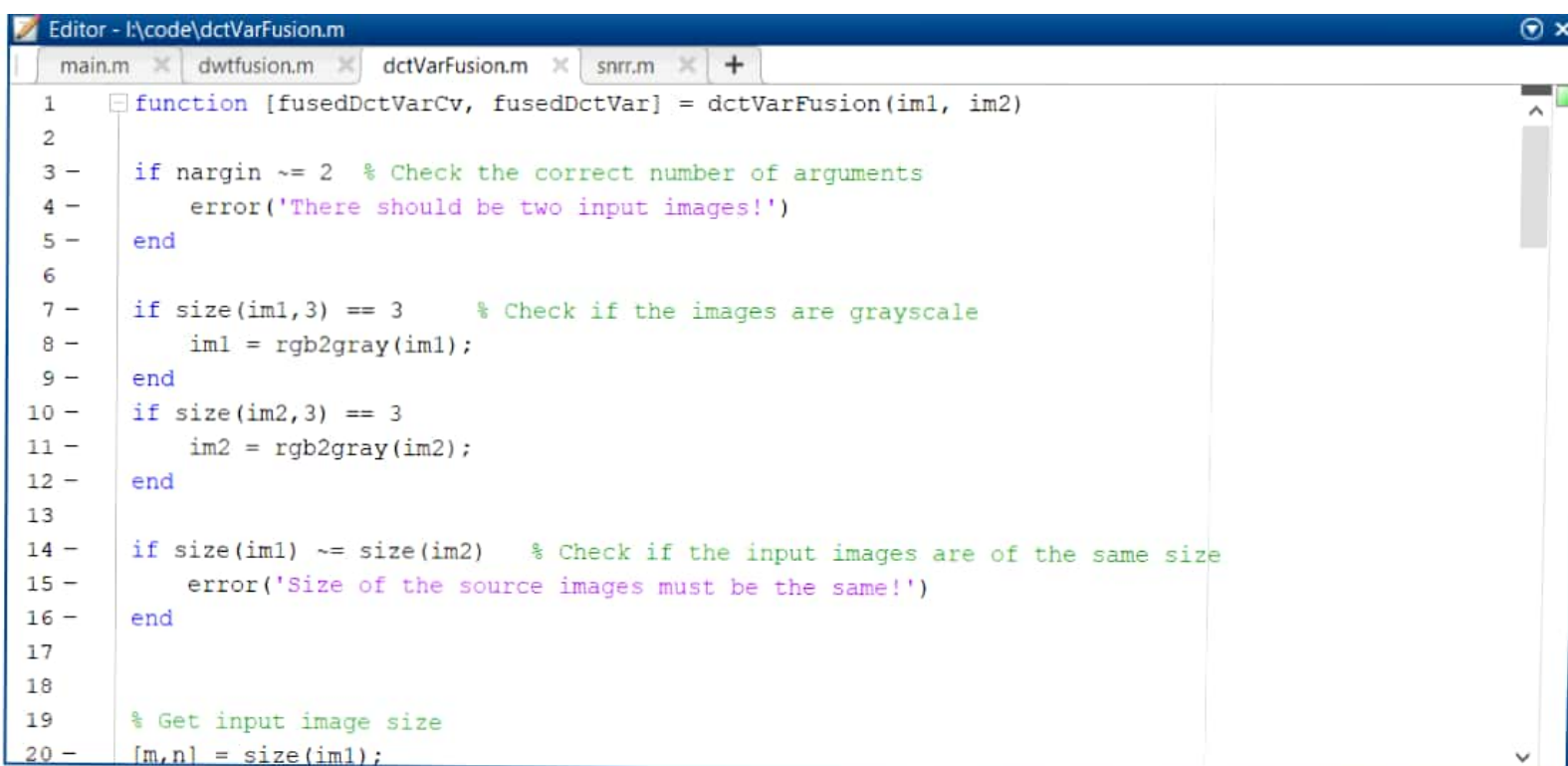
```
1 function im3 = dwtfusion(im1, im2)
2
3
4
5 %% Wavelet Transform
6
7
8 [a1,b1,c1,d1]=dwt2(im1,'db2');
9 [a2,b2,c2,d2]=dwt2(im2,'db2');
10
11 [k1,k2]=size(a1);
12
13 %% Fusion Rules
14
15 %% Average Rule
16
17 for i=1:k1
18     for j=1:k2
19         a3(i,j)=(a1(i,j)+a2(i,j))/2;
20     end
```

Editor - I:\code\dwtfusion.m

main.m x dwtfusion.m x dctVarFusion.m x snrr.m x +

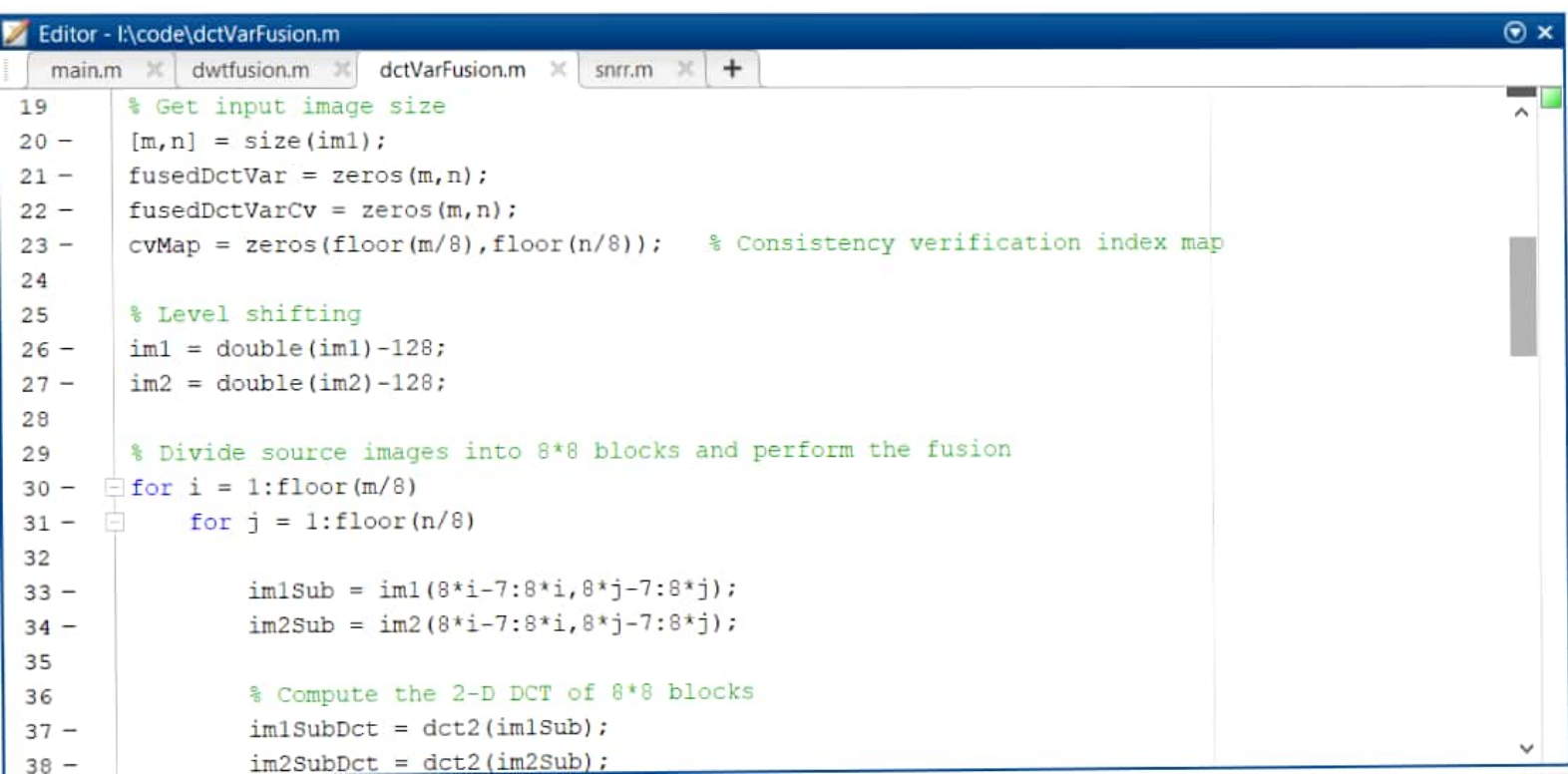
```
20 -     end
21 - end
22
23 %% Max Rule
24
25
26 - for i=1:k1
27 -     for j=1:k2
28 -         b3(i,j)=max(b1(i,j),b2(i,j));
29 -         c3(i,j)=max(c1(i,j),c2(i,j));
30 -         d3(i,j)=max(d1(i,j),d2(i,j));
31 -     end
32 - end
33
34
35
36
37
38 %% Inverse Wavelet Transform
39
```

```
Editor - I:\code\dwtfusion.m
main.m x dwtfusion.m x dctVarFusion.m x snrr.m x +
38 %% Inverse Wavelet Transform
39
40 - im3=idwt2(a3,b3,c3,d3,'db2');
41
42 - subplot(2,2,3), imshow(im3,[]), title('Fused Image using DWT');
43
44
45 %% Performance Criteria
46
47 - CR1=corr2(im1,im3);
48 - CR2=corr2(im2,im3);
49 - S1=snrr(double(im1),double(im3));
50 - S2=snrr(double(im2),double(im3));
51
52
53 - fprintf('Correlation between first image and dwt fused image =%f \n\n',CR1);
54 - fprintf('Correlation between second image and dwt fused image =%f \n\n',CR2);
55 - fprintf('SNR between first image and dwt fused image =%4.2f db\n\n',S1);
56 - fprintf('SNR between second image and dwt fused image =%4.2f db \n\n',S2);
57
```



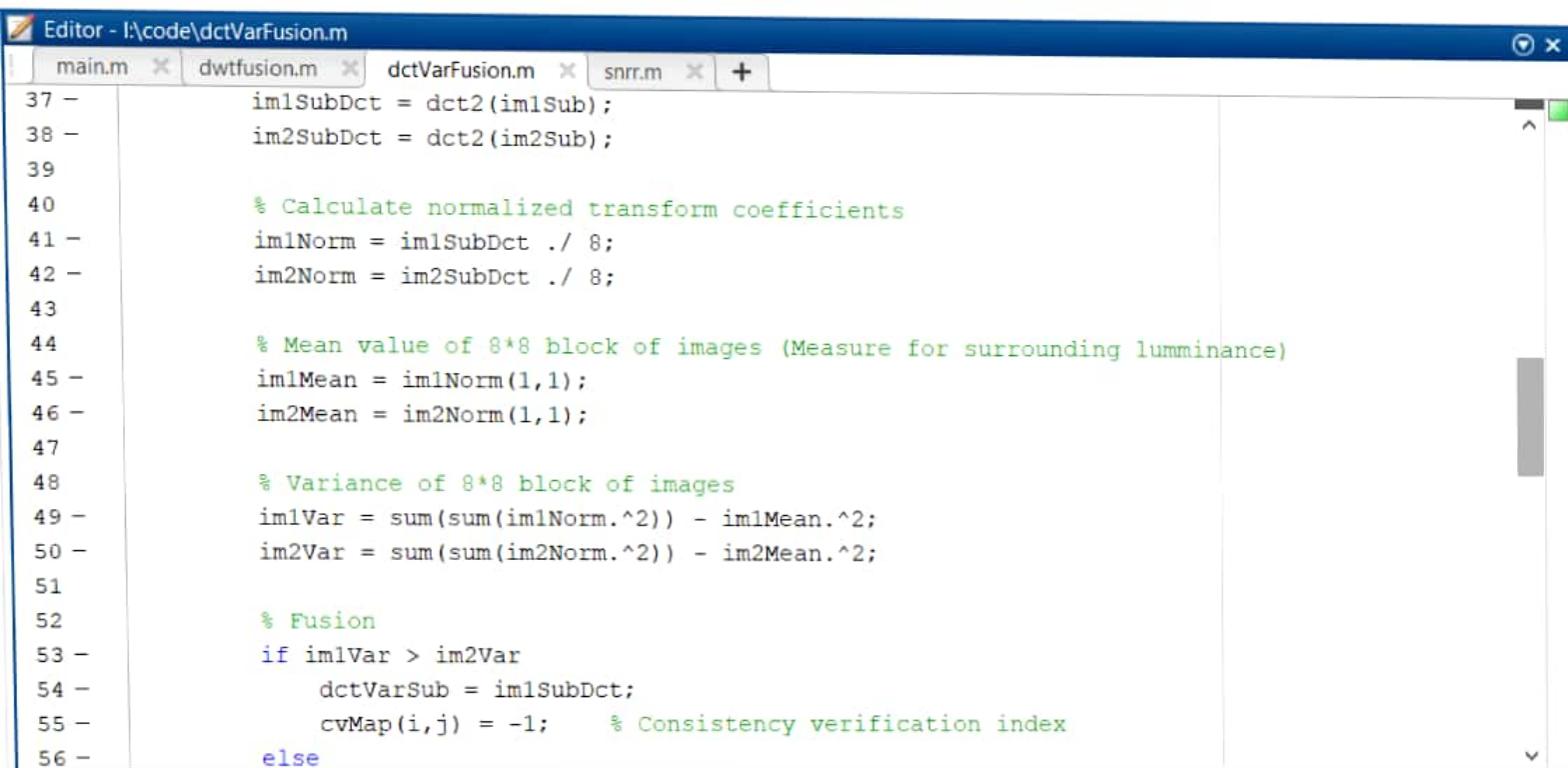
The image shows a MATLAB Editor window with the title bar "Editor - I:\code\dctVarFusion.m". The window contains several tabs: "main.m", "dwtfusion.m", "dctVarFusion.m", and "snrr.m". The "dctVarFusion.m" tab is active, displaying the following MATLAB code:

```
1 function [fusedDctVarCv, fusedDctVar] = dctVarFusion(im1, im2)
2
3 if nargin ~= 2 % Check the correct number of arguments
4     error('There should be two input images!')
5 end
6
7 if size(im1,3) == 3 % Check if the images are grayscale
8     im1 = rgb2gray(im1);
9 end
10 if size(im2,3) == 3
11     im2 = rgb2gray(im2);
12 end
13
14 if size(im1) ~= size(im2) % Check if the input images are of the same size
15     error('Size of the source images must be the same!')
16 end
17
18
19 % Get input image size
20 [m,n] = size(im1);
```



The image shows a MATLAB Editor window with the title bar "Editor - I:\code\dctVarFusion.m". The window contains a script named "dctVarFusion.m" with the following code:

```
19 % Get input image size
20 [m,n] = size(im1);
21 fusedDctVar = zeros(m,n);
22 fusedDctVarCv = zeros(m,n);
23 cvMap = zeros(floor(m/8),floor(n/8)); % Consistency verification index map
24
25 % Level shifting
26 im1 = double(im1)-128;
27 im2 = double(im2)-128;
28
29 % Divide source images into 8*8 blocks and perform the fusion
30 for i = 1:floor(m/8)
31     for j = 1:floor(n/8)
32
33         im1Sub = im1(8*i-7:8*i,8*j-7:8*j);
34         im2Sub = im2(8*i-7:8*i,8*j-7:8*j);
35
36         % Compute the 2-D DCT of 8*8 blocks
37         im1SubDct = dct2(im1Sub);
38         im2SubDct = dct2(im2Sub);
```



The image shows a MATLAB Editor window titled "Editor - I:\code\dctVarFusion.m". The window has a tab bar at the top with four tabs: "main.m", "dwtfusion.m", "dctVarFusion.m", and "snrr.m". The "dctVarFusion.m" tab is currently selected. The code in the editor is as follows:

```
37 -         im1SubDct = dct2(im1Sub);
38 -         im2SubDct = dct2(im2Sub);
39
40         % Calculate normalized transform coefficients
41 -         im1Norm = im1SubDct ./ 8;
42 -         im2Norm = im2SubDct ./ 8;
43
44         % Mean value of 8*8 block of images (Measure for surrounding lumminance)
45 -         im1Mean = im1Norm(1,1);
46 -         im2Mean = im2Norm(1,1);
47
48         % Variance of 8*8 block of images
49 -         im1Var = sum(sum(im1Norm.^2)) - im1Mean.^2;
50 -         im2Var = sum(sum(im2Norm.^2)) - im2Mean.^2;
51
52         % Fusion
53 -         if im1Var > im2Var
54 -             dctVarSub = im1SubDct;
55 -             cvMap(i,j) = -1;    % Consistency verification index
56 -         else
```

```
Editor - I:\code\dctVarFusion.m
main.m x dwtfusion.m x dctVarFusion.m x snrr.m x +
55 -         cvMap(i,j) = -1;    % Consistency verification index
56 -     else
57 -         dctVarSub = im2SubDct;
58 -         cvMap(i,j) = +1;    % Consistency verification index
59 -     end
60
61     % Compute the 2-D inverse DCT of 8*8 blocks and construct fused image
62     fusedDctVar(8*i-7:8*i,8*j-7:8*j) = idct2(dctVarSub);    % DCT+Variance method
63
64 end
65 end
66
67 % Consistency verification using a Majority Filter
68 fi = ones(7)/49;    % Filter kernel 7*7
69 cvMapFiltered = imfilter(cvMap, fi, 'symmetric');    % Filtered index map
70 cvMapFiltered = imfilter(cvMapFiltered, fi, 'symmetric');
71
72
73 for i = 1:m/8
74     for j = 1:n/8
```



```
Editor - I:\code\dctVarFusion.m
main.m x dwtfusion.m x dctVarFusion.m x snrr.m x +
73 - for i = 1:m/8
74 -     for j = 1:n/8
75 -         % DCT+Variance+CV method
76 -         if cvMapFiltered(i,j) <= 0
77 -             fusedDctVarCv(8*i-7:8*i,8*j-7:8*j) = im1(8*i-7:8*i,8*j-7:8*j);
78 -         else
79 -             fusedDctVarCv(8*i-7:8*i,8*j-7:8*j) = im2(8*i-7:8*i,8*j-7:8*j);
80 -         end
81 -     end
82 - end
83 -
84 -
85 -
86 - fusedDctVar = uint8(double(fusedDctVar)+128);
87 - fusedDctVarCv = uint8(double(fusedDctVarCv)+128);
88 - subplot(2,2,4), imshow(fusedDctVarCv), title('DCT+Variance+CV fusion result');
89 -
90 - CR3 = corr2(im1,fusedDctVarCv);
91 - CR4 = corr2(im2,fusedDctVarCv);
92 - S3 = snrr(double(im1),double(fusedDctVarCv));
```

```
Editor - I:\code\dctVarFusion.m
main.m x dwtfusion.m x dctVarFusion.m x snrr.m x +
81
82 -     end
83 - end
84
85
86 - fusedDctVar = uint8(double(fusedDctVar)+128);
87 - fusedDctVarCv = uint8(double(fusedDctVarCv)+128);
88 - subplot(2,2,4), imshow(fusedDctVarCv), title('DCT+Variance+CV fusion result');
89
90 - CR3 = corr2(im1,fusedDctVarCv);
91 - CR4 = corr2(im2,fusedDctVarCv);
92 - S3 = snrr(double(im1),double(fusedDctVarCv));
93 - S4 = snrr(double(im2),double(fusedDctVarCv));
94
95
96 - fprintf('Correlation between first image and dct fused image =%f \n\n',CR3);
97 - fprintf('Correlation between second image and dct fused image =%f \n\n',CR4);
98 - fprintf('SNR between first image and dct fused image =%4.2f db\n\n',S3);
99 - fprintf('SNR between second image and dct fused image =%4.2f db \n\n',S4);
100
```



The image shows a MATLAB Editor window titled "Editor - I:\code\snrr.m". The window contains four tabs: "main.m", "dwtfusion.m", "dctVarFusion.m", and "snrr.m". The "snrr.m" tab is active, displaying the following code:

```
1 function r = snrr(in, est)
2
3
4     error = in - est;
5     r = 10 * log10((255^2) / mean(error(:).^2));
```