

Image and Video Processing

Programming Assignment 2

Matrix operations



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1 Introduction

The basic matrix operations were performed using the **Matlab**. Besides Matlab core operations, the Matrix computations toolbox and Linear Algebra toolbox were used. The following core operations were used.

- **inv()**: Inverse of a matrix.
- **det()**: Determinant of a matrix.
- **transpose()**: Transpose of a matrix (or use ' for conjugate transpose).
- **isequal()**: Compare matrices for equality.
- **eye()**: Identity matrix.
- *****: Matrix multiplication.

2 Matrix Operations

2.1 Define Matrix Size

```
matrixSize = 4;
```

2.2 Define Square Matrix and Display It

```
squareMatrix = [-0.3452, 0.8992, 0.2103, -0.1814;  
                -0.5654, -0.3912, 0.5457, 0.4686;  
                -0.6074, -0.1466, -0.7731, 0.1094;  
                -0.4386, -0.1392, 0.2432, -0.8527];  
disp('The square matrix is:');  
disp(squareMatrix);
```

2.3 Transpose Operation

```
transposeMatrix = squareMatrix';  
disp('Transpose of the Matrix:');  
disp(transposeMatrix);
```

2.4 Conjugate Transpose Operation

```
conjugateTransposeMatrix = squareMatrix';  
disp('Conjugate Transpose of the Matrix:');  
disp(conjugateTransposeMatrix);
```

2.5 Inverse Operation

```
if det(squareMatrix) == 0  
    disp('The matrix is singular and does not have an inverse.');
```

```
else  
    inverseMatrix = inv(squareMatrix);  
    disp('Inverse of the Matrix:');  
    disp(inverseMatrix);  
end
```

2.6 Check Orthogonality of the Matrix

```
isOrthogonal = isequal(round(squareMatrix * transposeMatrix), eye(matrixSize));  
disp(['Is the matrix orthogonal? ', mat2str(isOrthogonal)]);
```

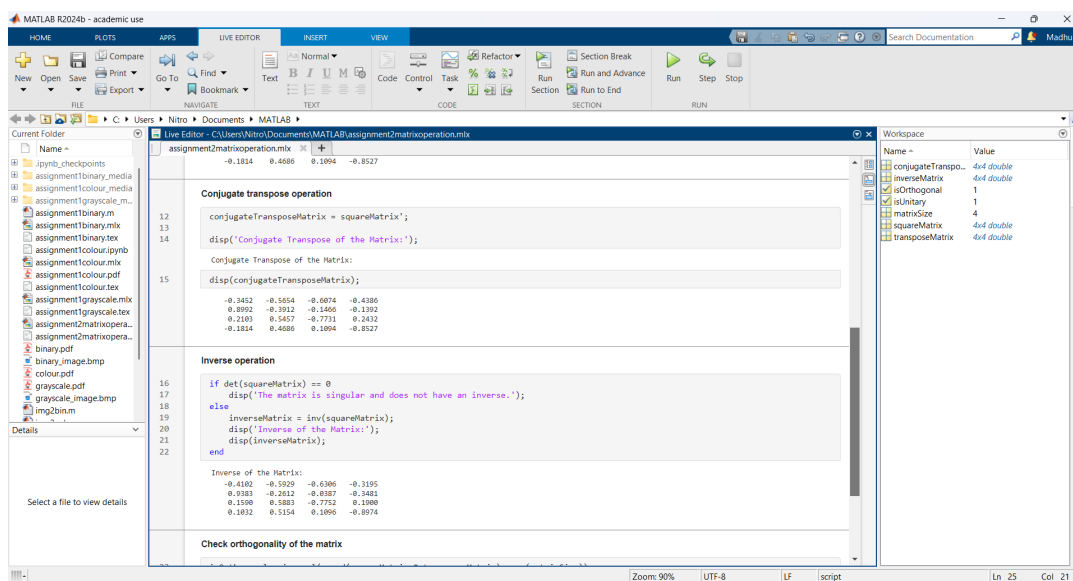
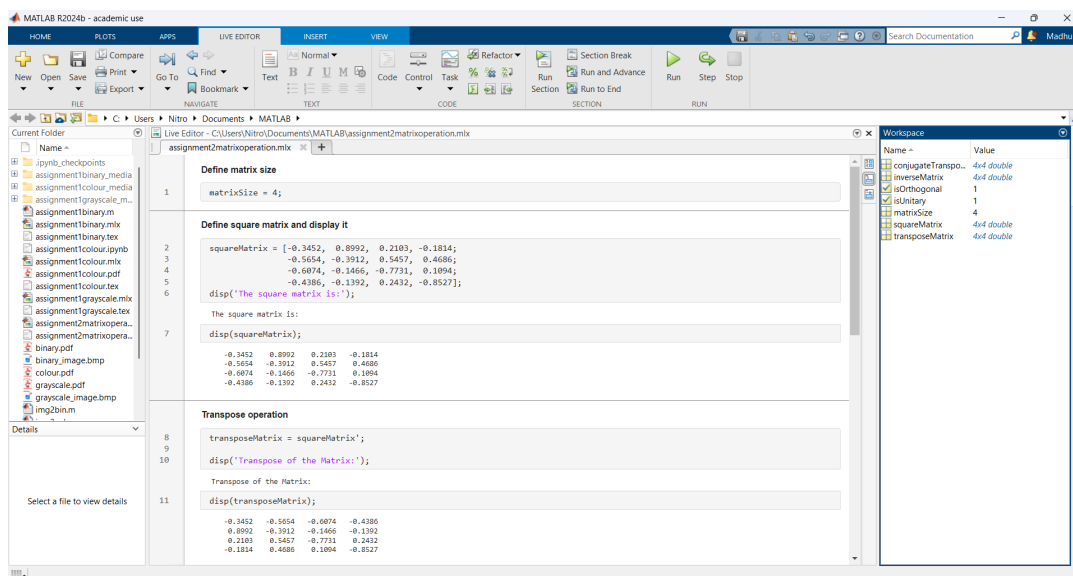
Is the matrix orthogonal? true

2.7 Check Whether the Matrix is Unitary

```
isUnitary = isequal(round(squareMatrix * conjugateTransposeMatrix), eye(matrixSize));  
disp(['Is the matrix unitary? ', mat2str(isUnitary)]);
```

Is the matrix unitary? true

3 Screenshots



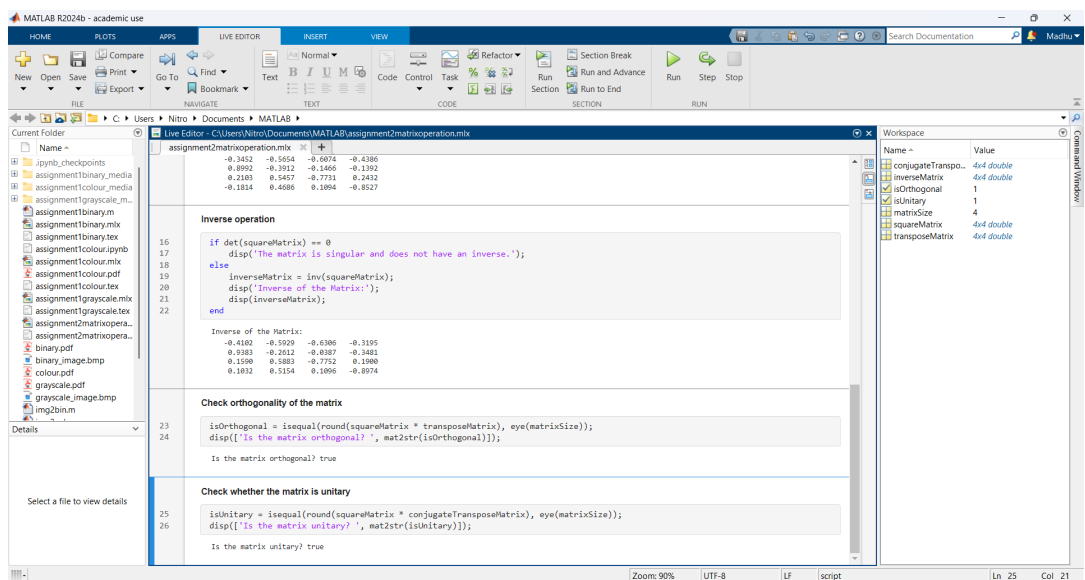


Figure 1: Matrix operations