

## rotate3DVector

Rotates a 3 dimensional vector with x-, y- and z-components in a 3 dimensional coordinate system along the x-, y- and z-axes. Using rotation matrix for x-, y- and z-axes. Angle must be served in degree. Vector must be a column vector 3 x 1 or matrix related x-, y-, z-components 3 x N.

This function was originally created by Thorben Schütthe is ported into source code under improvements and including Matlab built-in functions. Function rewritten.

### Syntax

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```
rotated = rotate3DVector(vector, alphaX, betaY, gammaZ)
```

### Description

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**rotated = rotate3DVector(vector, alphaX, betaY, gammaZ)** returns a rotated vector which is rotated by given angles on related axes. alphaX rotates along the x-axes, betaY along the y-axes and gammaZ along the z-axes. Therefore each rotation is described by belonging rotation matrix. The resulting rotation of the vector is computed by the matrix and vector multiplication of the rotation matrices and the input vector.

$$v' = Av = R_z(\gamma)R_y(\beta)R_x(\alpha)v$$

### Examples

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```
% rotate a vector along z-axes by 45°
vector = [1; 0; 0]
rotated = rotate3DVector(vector, 0, 0, 45)

% rotate a vector along z-axes by 35° with a tilt in x-axes by 1°
vector = [1; 0; 0]
rotated = rotate3DVector(vector, 1, 0, 35)

% rotate a vector along z-axes by 35° with a tilt in x-axes by 1° and a
% tilt in y-axes by 5°
vector = [1; 0; 0]
rotated = rotate3DVector(vector, 1, 5, 35)
```

### Input Arguments

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**vector** is a 3 x N column vector of real numbers which represents the a vector in a 3D coordinate system with x-, y- and z-components.

**alphaX** is a scalar angular value in degree and rotates the vector in the x-axes.

**betaY** is a scalar angular value in degree and rotates the vector in the y-axes.

**gammaZ** is a scalar angular value in degree and rotates the vector in the z-axes.

### Output Arguments

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**rotated** is rotation of vector by passed axes related angles.

### Requirements

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- Other m-files required: None
- Subfunctions: rotx, roty, rotz
- MAT-files required: None

## See Also

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- [rotx](#)
- [roty](#)
- [rotz](#)
- [Wikipedia Drehmatrix](#)

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```
function [rotated] = rotate3DVector(vector, alphaX, betaY, gammaZ)
    arguments
        % validate as vecotor or matrix of size 3 x N
        vector (3,:) double {mustBeReal}
        % validate angles as scalar
        alphaX (1,1) double {mustBeReal}
        betaY (1,1) double {mustBeReal}
        gammaZ (1,1) double {mustBeReal}
    end

    % rotate vector or vector field as 3 x N matrix counterclockwise by given
    % angles along axes, calculate rotation matrices for each axes and
    % multiply with input vector
    rotated = rotz(gammaZ) * roty(betaY) * rotx(alphaX) * vector(:, 1:end);
end
```