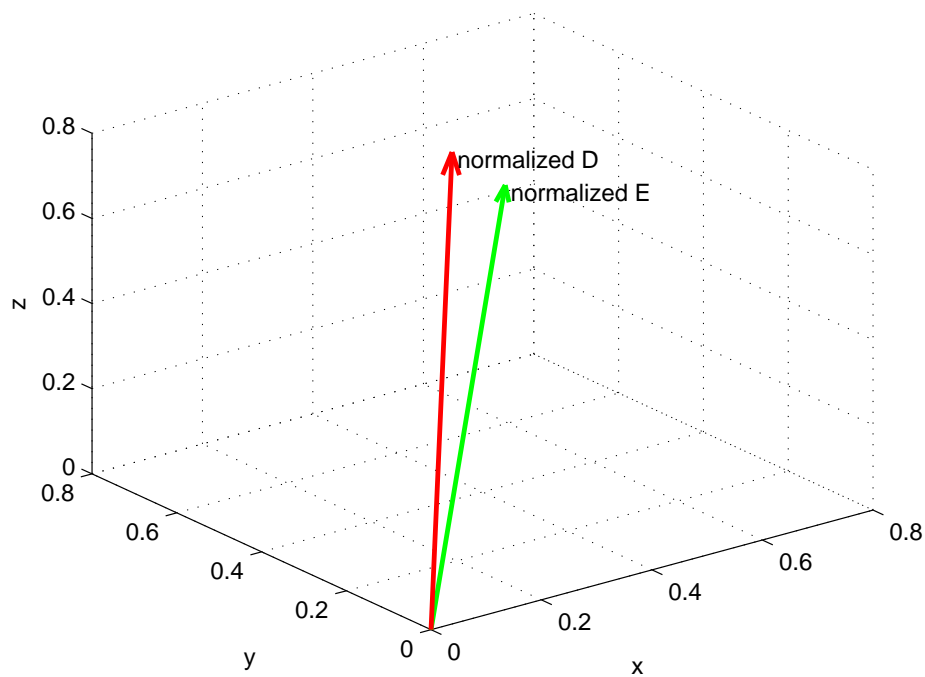


**MATLAB EXERCISE 2.2 Permittivity tensor of an anisotropic medium.** Based on Eq.(2.3) (from the book), compute in MATLAB the electric flux density vector,  $\mathbf{D}$  ( $\mathbf{D}$ ), in an anisotropic dielectric if the electric field intensity vector and the relative-permittivity tensor are given by  $\mathbf{E} = [1 \ 1 \ 1]$  V/m and  $\text{epsr} = [2.51 \ 0 \ 0; 0 \ 2.99 \ 0; 0 \ 0 \ 4.11]$ , respectively. Using MATLAB function `quiver3`, plot vectors  $\mathbf{E}$  and  $\mathbf{D}$  (see MATLAB Exercise 1.3). (*ME2.2.m on IR*)

**SOLUTION:**

The electric flux density vector is computed to be  $\mathbf{D} = [22.22 \ 26.47 \ 36.39]$  pC/m<sup>2</sup>. Fig.S2.2 shows a 3-D plot of normalized vectors  $\mathbf{E}$  and  $\mathbf{D}$ .



**Figure S2.2** 3-D plot of normalized vectors  $\mathbf{E}$  and  $\mathbf{D}$  in an anisotropic dielectric – using MATLAB function `quiver3`; for MATLAB Exercise 2.2.

```
%
% Book: MATLAB-Based Electromagnetics (Pearson Prentice Hall)
% Author: Branislav M. Notaros
% Instructor Resources
% (c) 2011
%
% This MATLAB code or any part of it may be used only for
% educational purposes associated with the book
%
%
% Permittivity tensor of an anisotropic medium
% This program calculates electric flux density vector for the given
% electric field intensity vector and permittivity tensor of an anisotropic
% dielectric

clear all;
close all;
EPS0 = 8.8542*10^(-12);

E = [1,1,1];
Emag = sqrt(E(1)^2 + E(2)^2 + E(3)^2);

% Permittivity tensor of an anisotropic medium
EPSR = zeros(3,3);
EPSR (1,1) = 2.51;
EPSR (2,2) = 2.99;
EPSR (3,3) = 4.11;

D = EPS0.*EPSR*E';
Dmag = sqrt(D(1)^2 + D(2)^2 + D(3)^2);

disp(D);

Enorm = E./Emag; % normalized E
Dnorm = D./Dmag; % normalized D

figure(1)
quiver3(0,0,0,Enorm(1),Enorm(2),Enorm(3),0,'g','LineWidth',2); hold on;
text(Enorm(1)-0.01,Enorm(2)-0.01,Enorm(3)-0.01,' normalized E');
quiver3(0,0,0,Dnorm(1),Dnorm(2),Dnorm(3),0,'r','LineWidth',2);
text(Dnorm(1)-0.01,Dnorm(2)-0.01,Dnorm(3)-0.01,' normalized D');hold off;
xlabel('x');
ylabel('y');
zlabel('z');
```