FYS3150: Project 2

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Abstract

1 Introduction

To show that the Jacobi mathod can be used it is important to show that an orthogonal(or unitary) transformation of a basis preserves the orthogonality trait of the basis. Lets consider a basis. $\vec{v}_i$:

$$\mathbf{v}_i = \begin{bmatrix} v_{i1} \\ \dots \\ \dots \\ v_{in} \end{bmatrix} \tag{1}$$

The basis is assumed to be orthogonal, which implies the following trait: $\vec{v}_j{}^T\vec{v}_i = \delta_{ij}$. Our task is not to show that a transformation $U\vec{v}_i = \vec{w}_i$ preserves the orthogonality, such that :

$$\vec{w}_j{}^T\vec{w}_i = \delta_{ij} \ , \tag{2}$$

which equates to

$$(U\vec{v}_j)^T U\vec{v}_i = \delta_{ij} \ . \tag{3}$$

Since the transformation is considered orthogonal we have $(AB)^T = B^T A^T$ and $U^T U = UU^T = I$, giving us

$$\vec{v}_j{}^T U^T U\vec{v}_i = \vec{v}_j I\vec{v}_i = \delta_{ij} \ , \tag{4}$$

returning us to the original expression for orthogonality of the dot product:

$$\vec{v}_j\vec{v}_i = \delta_{ij} \ . \tag{5}$$

Thus we have shown that orthogonality is perserved under the transformation U.

2 Method

3 Results

4 Discussion

5 Conclusion

6 References