Assignment 17

Sri Harsha CH

***Abstract*—This document explains the representation of transformations by matrix.**

Download all python codes from

https://github.com/harshachinta/EE5609−Matrix−Theory/tree/master/Assignments/Assignment17/code

and latex-tikz codes from

https://github.com/harshachinta/EE5609−Matrix−Theory/tree/master/Assignments/Assignment17

1 Problem

Let T be a linear operator on $\mathbf{F^n}$, let $\mathbf{A}$ be the matrix of T in the standard ordered basis for $\mathbf{F^n}$, and let W be the subspace of $\mathbf{F^n}$ spanned by the column vectors of $\mathbf{A}$. What does W have to do with T ?

2 Explanation

Let $\{\alpha_1, \alpha_2, \cdots, \alpha_n\}$ be an ordered basis of $\mathbf{F^n}$.
$\mathbf{A}$ is a matrix of T in the standard ordered basis. We know that the i^{th} column of matrix $\mathbf{A}$ is given by $T\epsilon_i$, hence columns of $\mathbf{A}$ are the images of the standard basis elements of $\mathbf{F^n}$.

We know that $\{T\epsilon_1, T\epsilon_2, \cdots, T\epsilon_n\}$ generate the range of T. Hence the columns of matrix $\mathbf{A}$ generate the range of T.
Since any generating set contains a basis for the generated space, we can say that the columns of $\mathbf{A}$ contains a basis of the range of T.