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Applied MATLAB Projects for Linear Algebra Students

In the process of developing and teaching an undergraduate applied linear algebra course, I have developed eight MATLAB-based projects that serve as a foundation for the course. Because of the time constraint for the session, I will focus on two of my favorite projects.

Matrix Transformations with Puzzles – Students practice using matrix transformations to rotate, reflect, and translate shapes to solve a puzzle. First, students are given matrices containing the vector coordinates of the seven shapes of the classic Tangram puzzle. Students write a script in MATLAB that will arrange the shapes into a given square using matrix transformations. Once they solve the 2D puzzle, students move on to tackle a 3D puzzle arranging seven 3D blocks into the shape of a cube. (Topics: Vectors, matrix transformations in two and three dimensions, homogeneous coordinates)

Airplane Bounding Box – Students start with a 3D vector image of an airplane, and then use principle component analysis to construct a minimal bounding box made up of six orthogonal planes around the airplane. (Topics: Eigenvalues, eigenvectors, principle component analysis, matrix transformations, equation of a plane, dot product, intersection of 3 planes) (Received July 13, 2015)