Title: Pole Shifting Theorem in Control Theory

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Abstract: The pole-shifting theorem is one of the basic results of the theory of linear dynamical systems with linear feedback. This thesis aims to compile all knowledge needed to fully understand the theorem in one place, in a way comprehensive to undergraduate students. To do this, I first define first order dynamical linear systems with constant coefficients with control and define the stability of such systems. Examining this property, I demonstrate that the characteristic polynomial of the coefficient matrix representing the system is a valuable indicator of the system's behaviour. Then I show that the definition of controllability motivated by discrete-time systems also holds for continuous-time systems. Using these notions, the pole-shifting theorem is then proved.

Keywords: discrete linear dynamical system with constant coefficients, continuous linear dynamical system with constant coefficients, eigenvalue assignment, control, controllability, linear feedback, stability, basic control theory