Problem Set 7 Solutions

Due: Tuesday, April 1, 2025 at 10am

Problem 7.1 [Rigidity Types]. In Lectures 10 and 11, we defined what it means for a linkage configuration to be *rigid* versus *flexible*; *generically rigid* versus *generically flexible* (a property of the underlying graph); and *infinitesimally rigid* versus *infinitesimally flexible*.

Which of the eight combinations are possible? For each row of the table, either find a linkage configuration with those properties, or show that such a linkage configuration does not exist. We have filled in two rows for you.

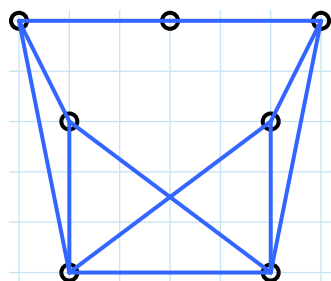| Rigid/flexible	Generically rigid/flexible	Infinitesimally rigid/flexible	Possible?
Rigid	Rigid	Rigid	Yes, e.g., a triangle in 2D
Rigid	Rigid	Flexible	Yes, Figure 1
Rigid	Flexible	Rigid	No, infinitesimal rigidity implies rigidity [Lecture 11]
Rigid	Flexible	Flexible	Yes, Figure 2
Flexible	Rigid	Rigid	No, infinitesimal rigidity implies generic rigidity [Lecture 11]
Flexible	Rigid	Flexible	Yes, Figure 3
Flexible	Flexible	Rigid	No, infinitesimal rigidity implies rigidity [Lecture 11]
Flexible	Flexible	Flexible	Yes, e.g., a 3-vertex path in 2D

Figure 1: Rigid, generically rigid, infinitesimally flexible linkage configuration.
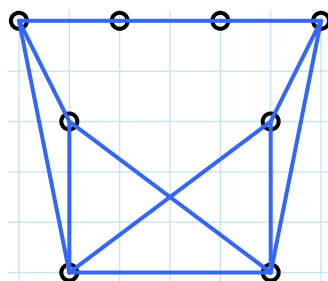

Figure 2: Rigid, generically flexible, infinitesimally flexible linkage configuration.
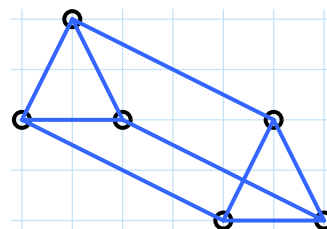

Figure 3: Flexible, generically rigid, infinitesimally flexible linkage configuration.