Da Vinci's Self-Supporting Bridge

Overview

What Is Friction?
When is friction useful?
When is it not useful?

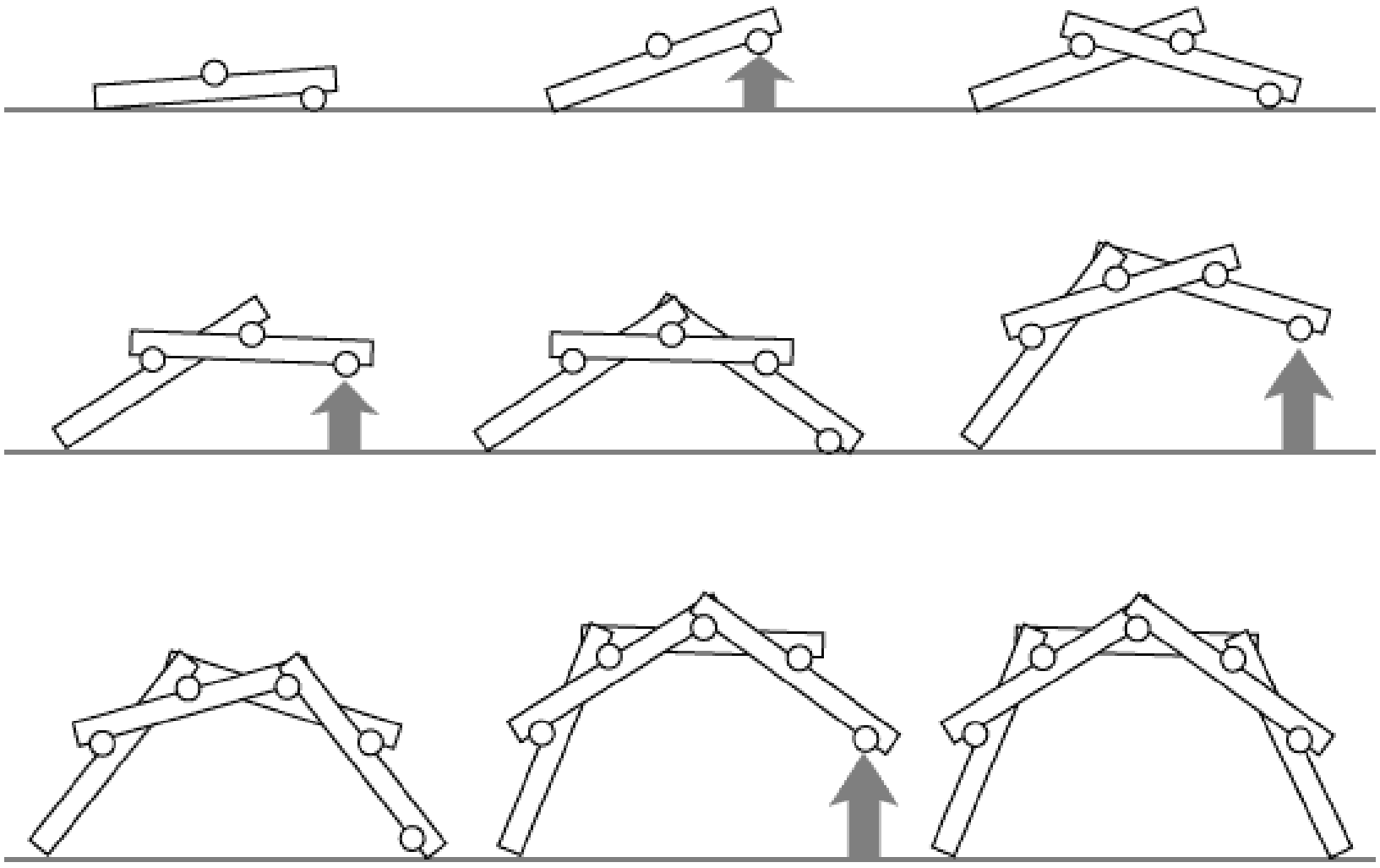
Materials Needed

- Five (5) beams without notches
- Ten (10) beams with three notches

Instructions

1. Using the beams construct a bridge with only using the diagram below as a guide.
2. The beams should connect by the use of friction-no fasteners.

Figure 1 - Side view of bridge.



Final Discussion

How does friction keep this bridge together?

Why would a bridge like this be useful?

How old do you think this design is?

Da Vinci's Self-Supporting Bridge **(For Instructor)**

Materials

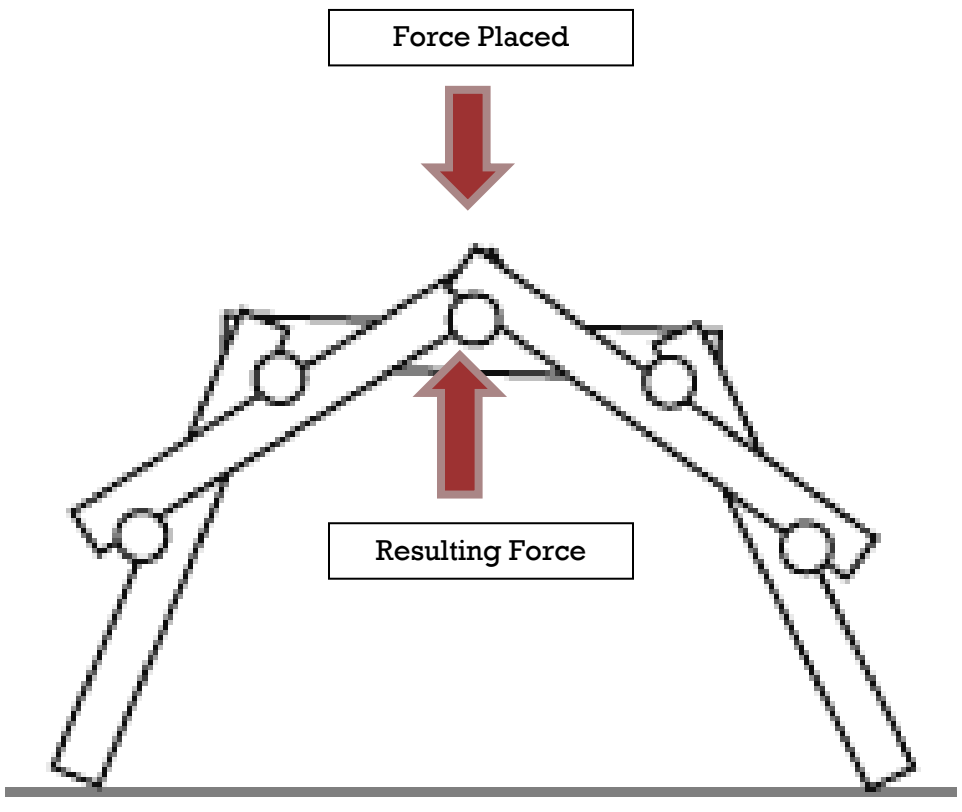
- Da Vinci Bridge Kit
- Assembled example Bridge
- "Da Vinci's Self-Supporting Bridge" Instructions for Students

Set-up Instructions

1. Set the example bridge out for the participants to see as a guide.
2. Discuss Friction and Da Vinci as an inventor
    a. What is friction? When is friction useful?
    b. Why would this design be useful?

Background Information

- Friction: Force resisting motion of Solid surfaces against each other.
- Beam: Solid structure capable of resisting a load.
- Da Vinci designed this bridge for military application
    - Da Vinci Called this bridge, "The Bridge of Safety"
    - Notice how the bridge can quickly be assembled and disassembled
    - Lack of fasteners aids in the quick assembly and disassembly
    - The more force there is placed on the structure, the more force there is holding the structure together.
    - F=ma



Procedure

1. Challenge students to construct a bridge using only beams and friction – no fasteners.
2. Students may work together in groups; it may be easier to construct the bridge with more than one set of hands.

After Activity Questions:

1. How does friction keep this bridge together?
2. Why would having a bridge like this be useful?
3. How old do you think this design is? (Invented in 1485-1487)

References:

http://www.mace.manchester.ac.uk/project/teaching/civil/structuralconcepts/StudentCoursework/contents/41.pdf

http://www.thingiverse.com/thing:204268

http://mindtrekkers.mtu.edu/lessons/26.pdf