Dynamics of Mapping Class Groups
Ian Katz, Yandi Wu, Yihan Zhou
Advisors: Dan Margalit, Balázs Strenner
Georgia Institute of Technology

Background

How efficient is this taffy puller?

n-armed taffy pulling action ↔ homeomorphism of an n-punctured plane

_Nielsen-Thurston Classification Theorem_ → to every homeomorphism of a surface we can attach a real number called the stretch factor

**Setup:**
- \( c \) = curve,
- \( f \) = homeomorphism,
- \( a \) = reference arc.

**Stretch Factor** = growth rate of \( i(f^n(c), a) \)

_Margalit-Strenner-Yurttas:_ Quadratic time algorithm that computes the stretch factor.

*Our Project:* Implement the algorithm.

Example

\[ f(c) \]

\[ f^2(c) \]

Stretch Factor = \( \phi^2 \approx 2.618 \)

The General Case

**Challenge:** How can we compute \( f^n(c) \) for arbitrary \( f, n, \) and \( c \)?

Representing curves as measured train tracks:

A basis of train tracks:

Image of a train track under a homeomorphism:

Unzip \( h(t) \) to obtain a basis train track:

*In progress work:* Generalize across all surfaces, homeomorphisms, and curves.