

# Human-Centric Computing

The Design Life Cycle

Lingyun Yu

## Introduction

- what annoys you in software that you use?
  - it does crash sometimes
  - it is missing feature X
  - I do not know how to achieve Y
  - it does not let me do Z but this would be simple to do
  - it does things I do not understand
  - it seems to pretend that it is smarter than me

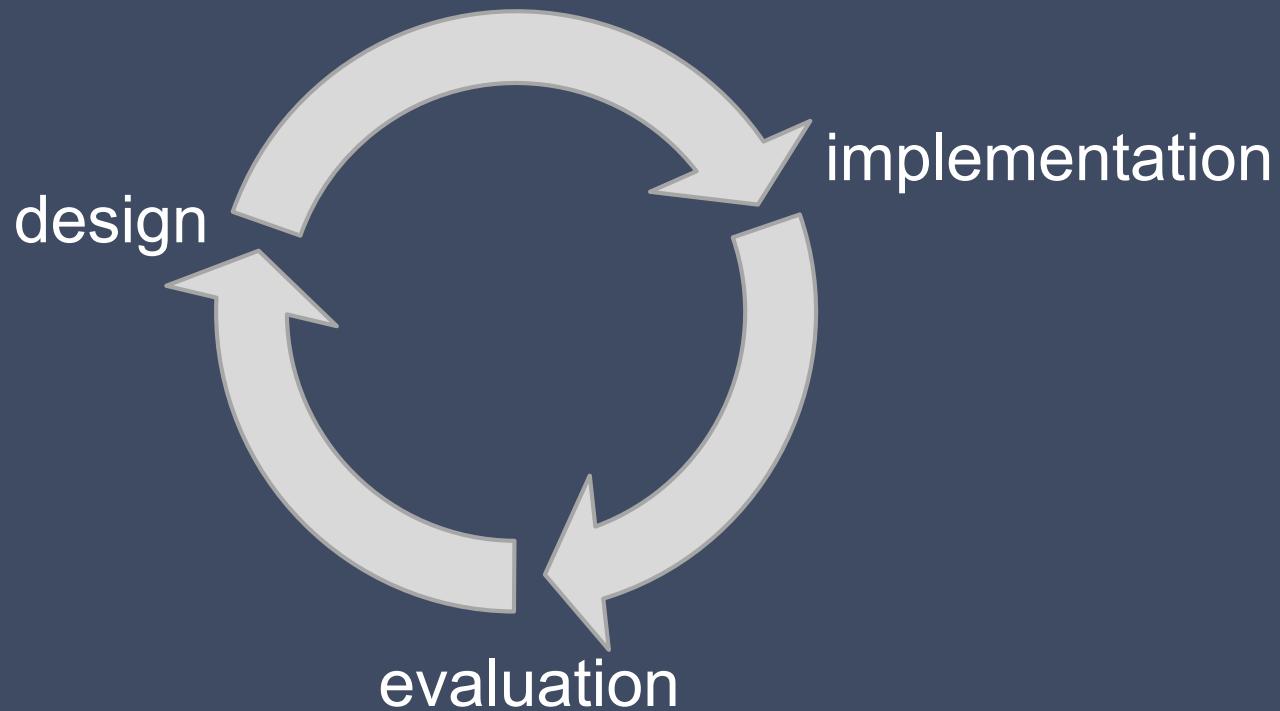
# Introduction

- how do you know software development?
  - idea/requirement list
  - (design and) implementation
  - (some) bug fixing – done! right?



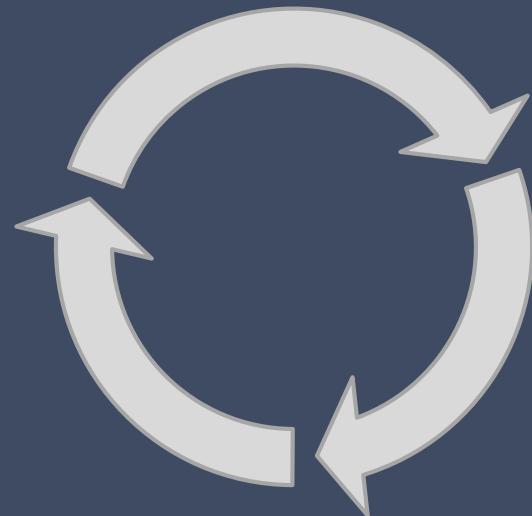
## The Design Life Cycle

- interface/interaction design – an iterative process:

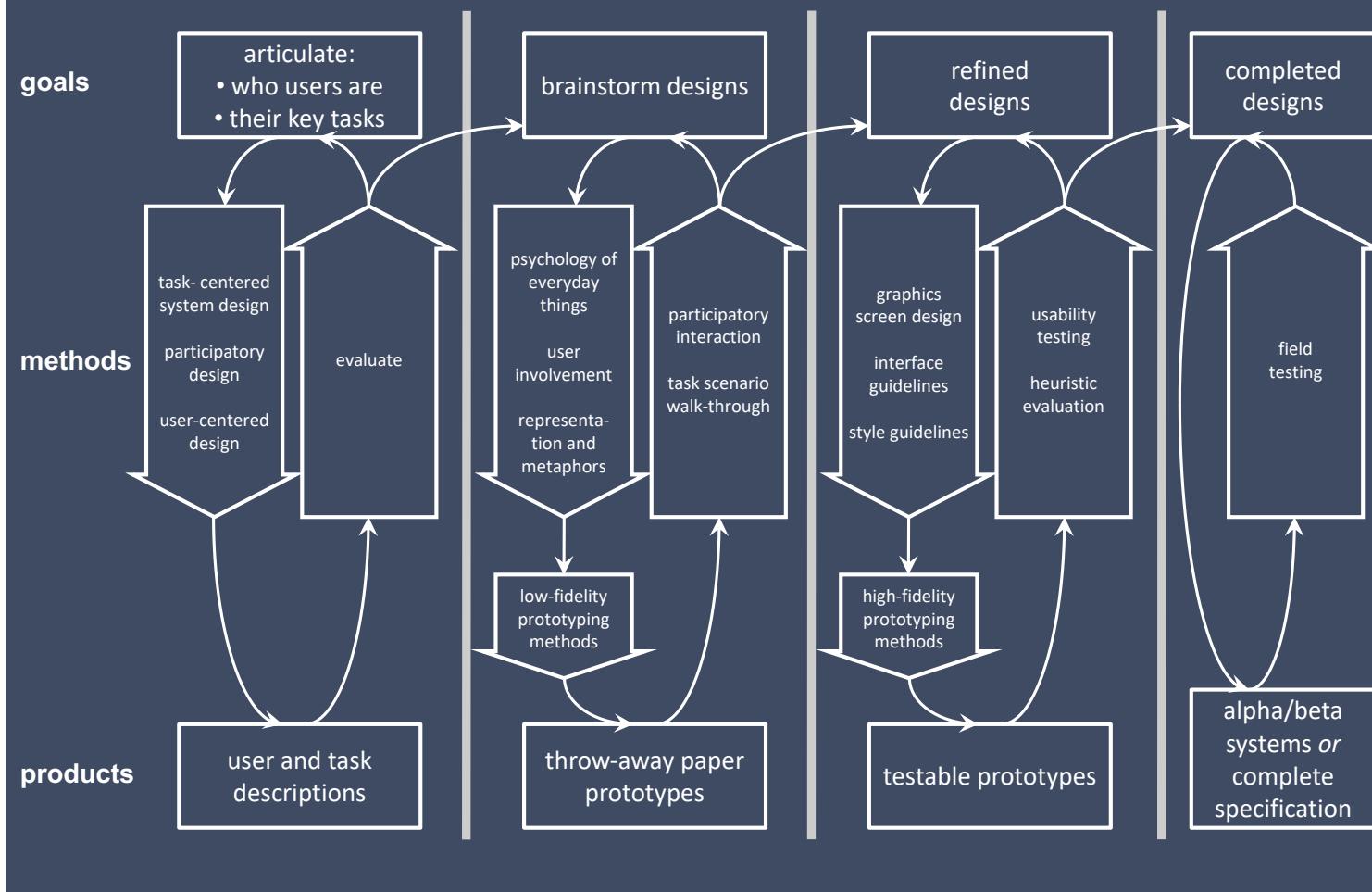


## The Design Life Cycle

- not always start with design
  - maybe first figure out what people need/want (evaluation)
  - maybe there was an initial system (implementation)
- quite expensive having to re-implement a (complex) system over and over
- better strategies needed – ideas?
  - different types of “implementation”
  - different degrees of evaluation



# An Interface Design Process



## Why an Interface Design Process?

- to avoid user frustration with the finished product
- to avoid unnecessary costs during product development
- to avoid additional costs after product development
- reasons for going over budget  
(ca. 63% of large software projects do)
  - user-requested changes
  - overlooked tasks
  - users did not understand their own requirements
  - insufficient user-developer communication and understanding

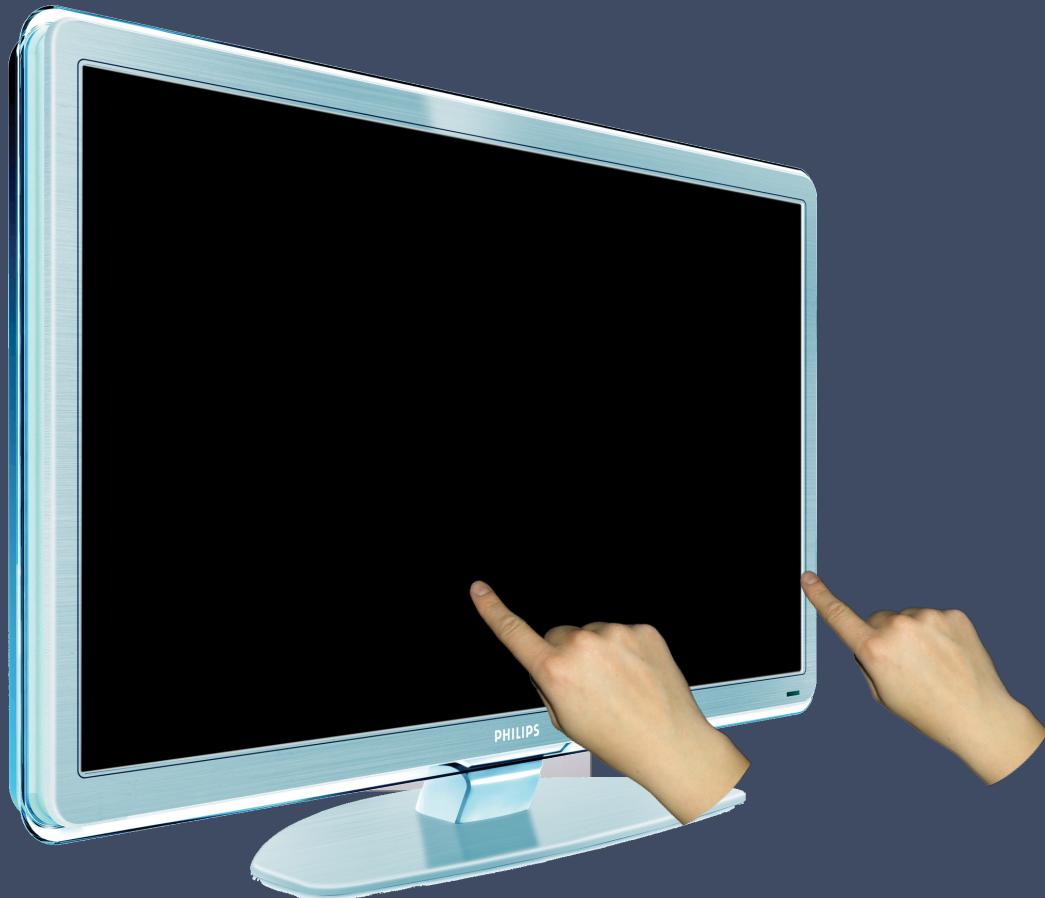
# Foundations for designing interfaces

- Understanding users and their tasks
  - Task-centered system design
    - how to develop task examples
    - how to evaluate designs through a task-centered walk-through
- Designing with the user
  - User-centered design and prototyping
    - methods for designing with the user
    - low and medium fidelity prototyping
  - Evaluating interfaces with users
    - the role of evaluation in interface design
    - how to observe people using systems to detect interface problems

## Considerations when designing interfaces

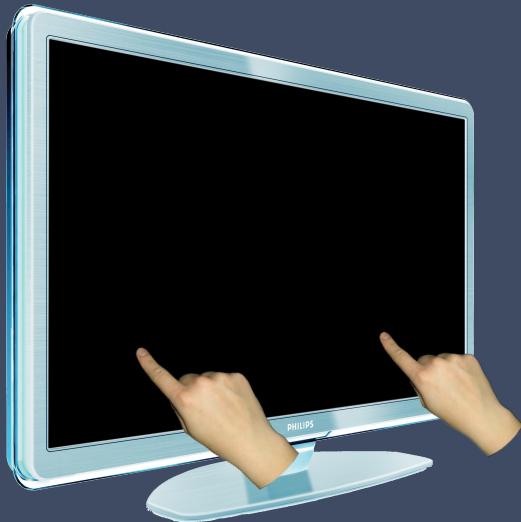
- do I know who my users and what their tasks are?
  - how much computer knowledge?
  - novice? occasional user? regular user? expert?
  - what do people want to achieve, what are the tasks?
- novel interfaces: what hardware I can expect?
  - not your usual setting with display(s), mouse, & keyboard
    - maybe no mouse input but direct touch or other indirect ways
    - maybe large display (several people), or very small display
    - maybe horizontal display instead of vertical (orientation)
    - maybe other sensing technologies that have other DOFs
    - maybe even non-display based input (think Wii and similar)
  - what if I add new interactivity to a typical setting?

## Example: Touchscreen TV



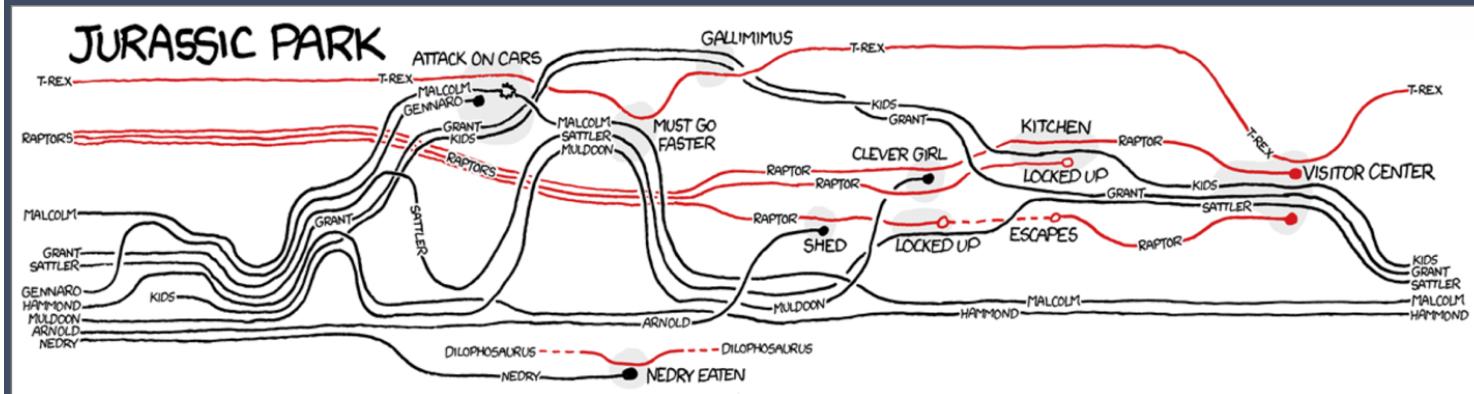
## Touchscreen TV Homework

- talk to friends and family:  
*what if the TV was a touchscreen?*
  - what would you like to do with a touchscreen TV?
  - what could you do with it?
  - what would be better than with our “normal” TVs?
  - what would be additional problems?
  - do you think you would like having a touchscreen TV?



## **EXAMPLES**

# iStoryline

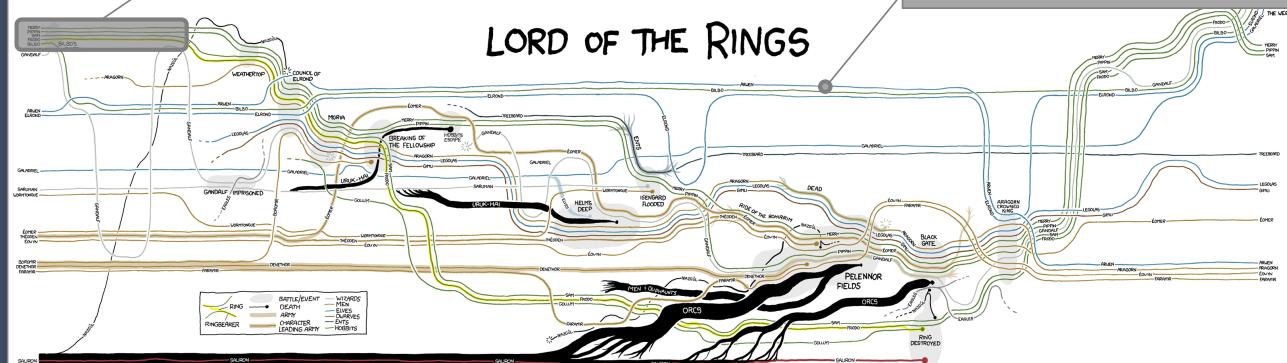


Tan T , Sadia R , Jiewen L , et al. iStoryline: Effective Convergence to Hand-drawn Storylines[J]. IEEE Transactions on Visualization and Computer Graphics, 2018:1-1.  
<https://cn.bing.com/search?q=iStoryline:+Effective+Convergence+to+Hand-drawn+Storylines&form=APMCS1&PC=APMC>

# Movie Narrative Charts

The vertical group of lines indicate who are together.

Each line represents one character.

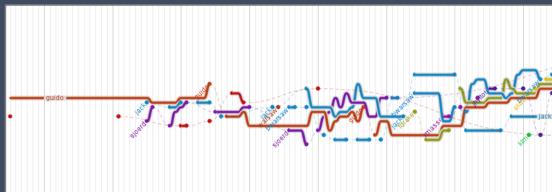


The horizontal axis is time.

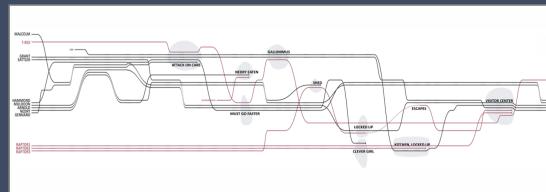
R. Munroe 2009

# Storyline Visualization

- Design Principles
  - D1 Lines in the same group should appear next to each other.
  - D2 Otherwise, lines must be far away from each other.
  - D3 A line must remain straight unless its group changes.

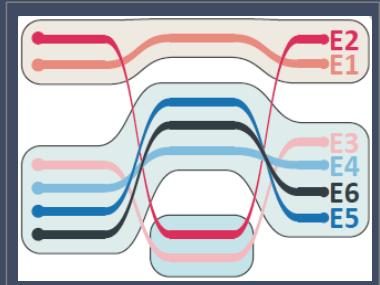


Ogawa and Ma. 2009

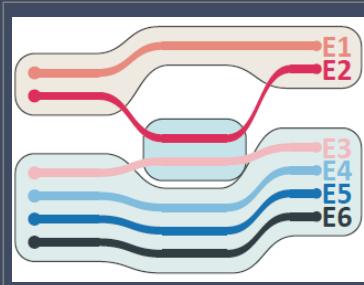


Tanahashi et al. 2012

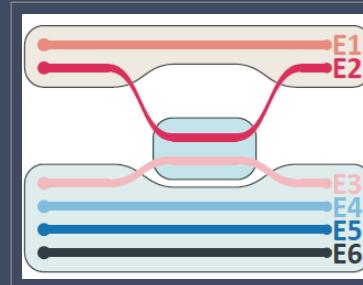
# Optimization Goals



Reducing line crossings

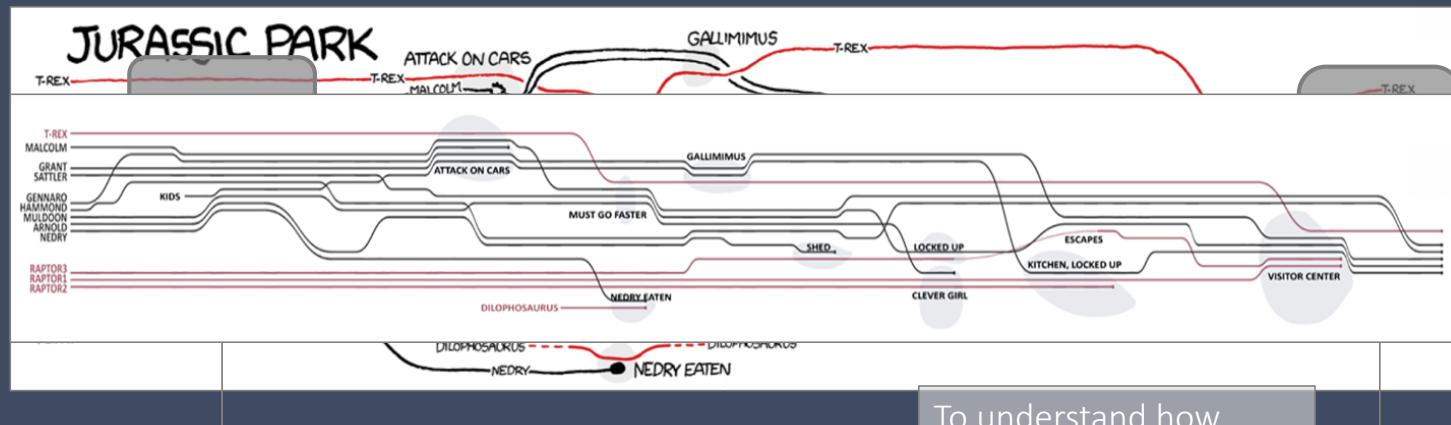


Reducing line wiggles



Reducing white space

# Motivation



The dinosaurs are grouped together to indicate that they are separated from human.

Repetitive layout

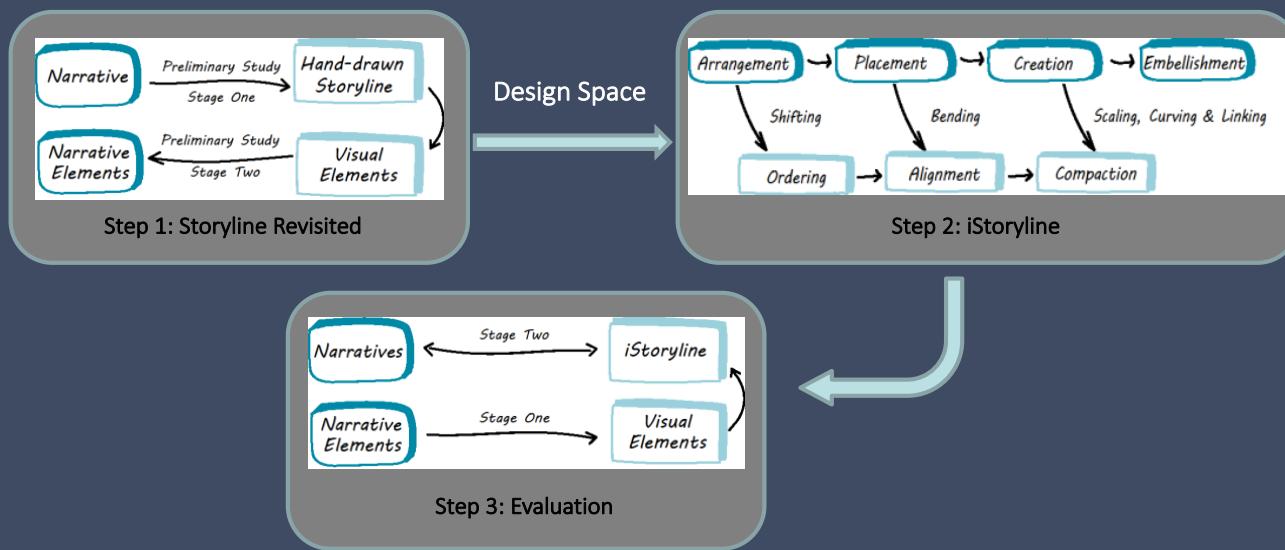
utive elements

An authoring tool for creating expressive storylines.

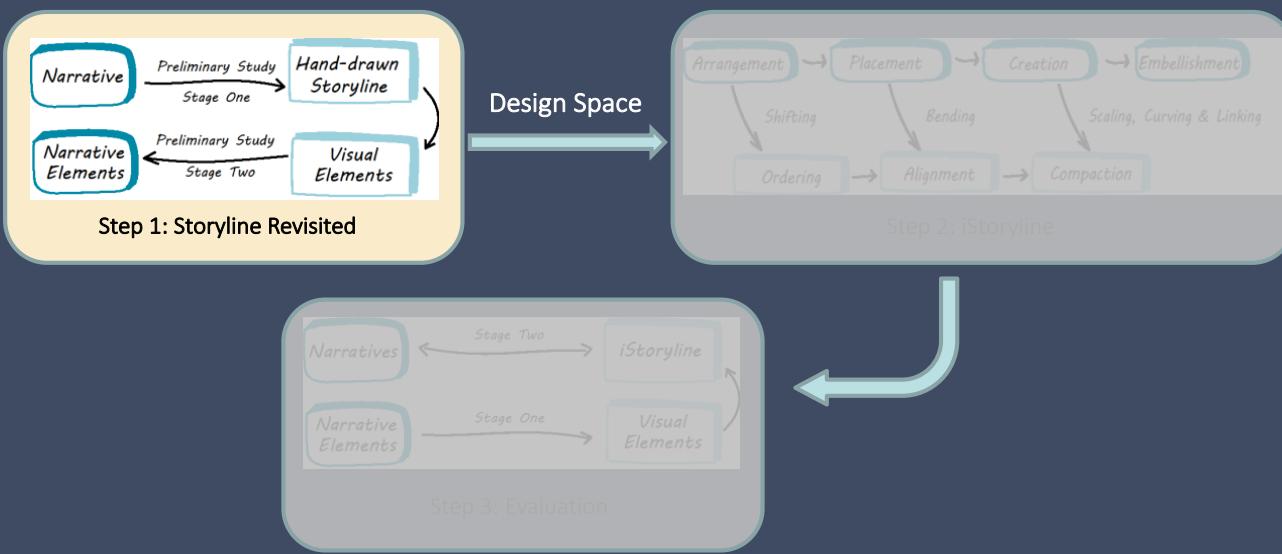
To understand how artists draw storyline from narrative. The dinosaurs and people run away from different directions.

We found the problem!  
Next?

# Workflow

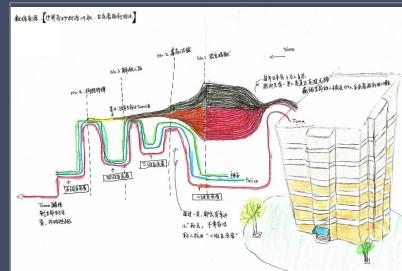
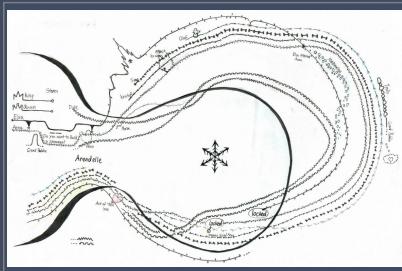
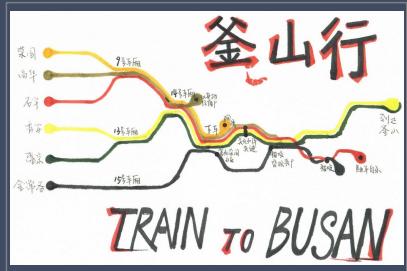


# Storyline Revisited



# Hand-drawn Storylines

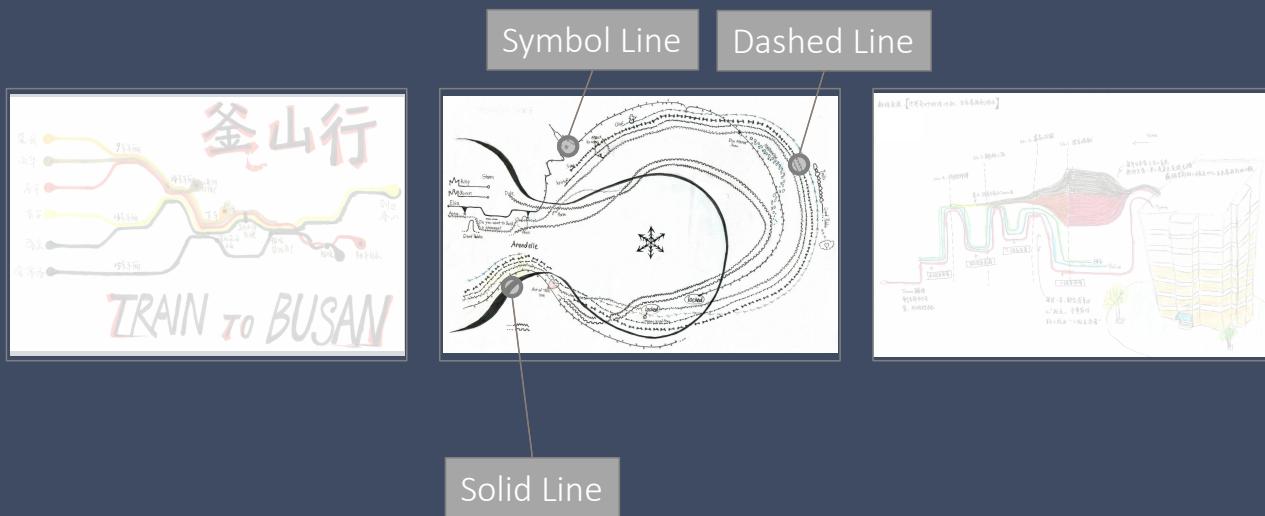
- We identified visual elements for hand-drawn illustrations.



GitHub <https://istoryline.github.io/>

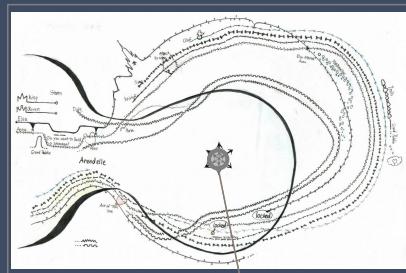
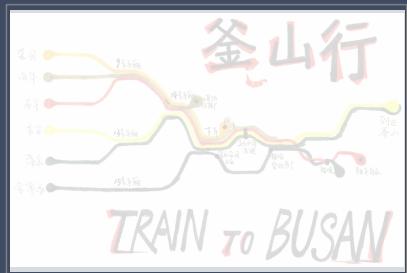
# Visual Elements

## Character

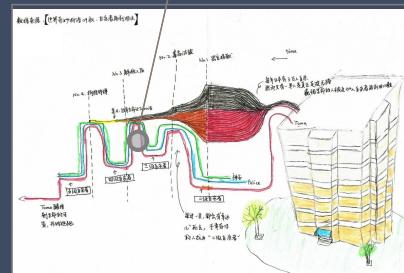


# Visual Elements

## Plot



Fluctuation Layout



Turning Layout

# Visual Elements

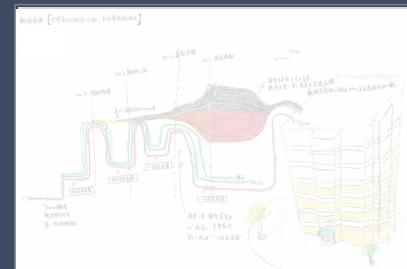
## Relationship

Merge/Split Group

Twine Group



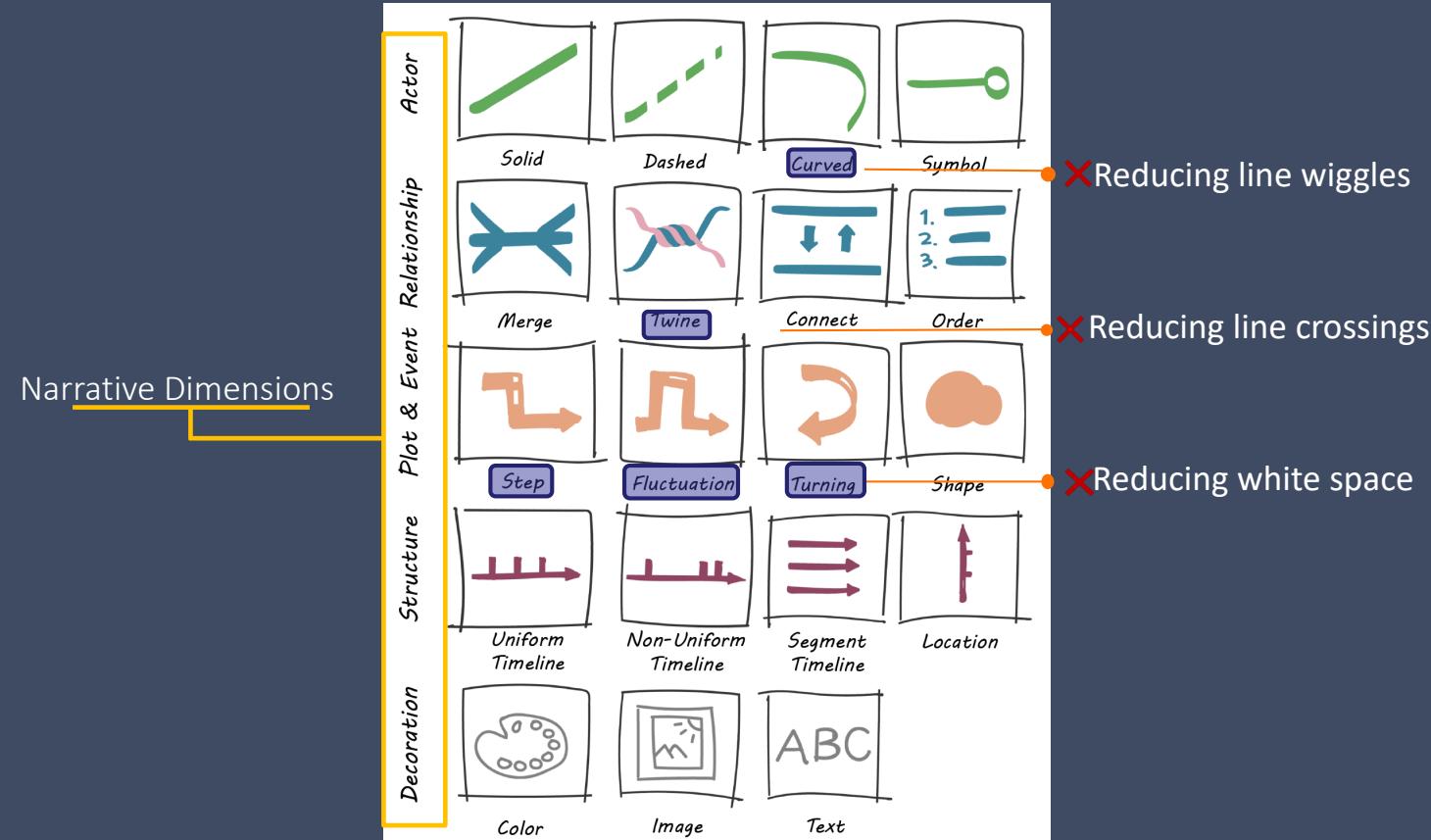
Connect Group



## Interviews

- 14 participants who adopted novel visual elements.
- Questions:
  - What elements did you consider as *the most essential* in a movie/story and what *visual elements* were used to convey them?
  - How did you emphasize *minor but affective* elements?
  - What *sequence of actions* did you follow to deal with the innovation in the storylines?

# Design Space

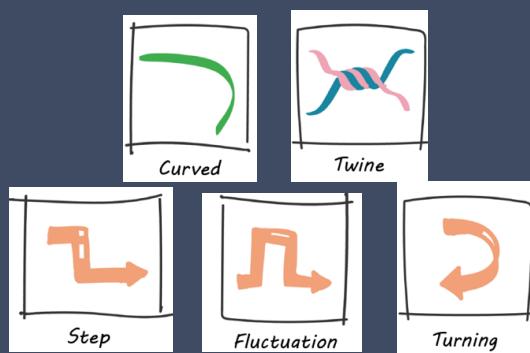


## Stage two: Visual elements -> Narrative elements

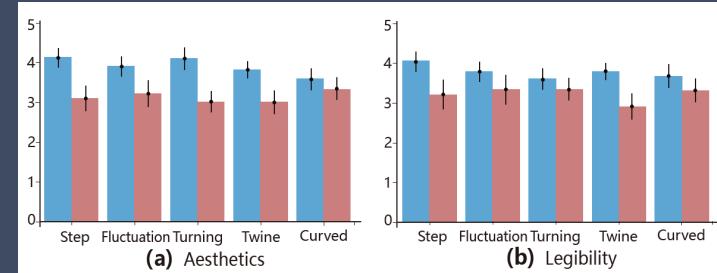
- We conduct another user study to validate the effectiveness of the five novel visual elements.
- 25 participants (8 females)
- Task:
  - Describe *a possible story* for the visual element or associate it with *a narrative element*: an actor, a relationship or a plot/event.
  - Rate the visual element in both the hand-drawn and *automatic storyline* conditions from different aspects.
  - Discuss the *implication* of the visual element in the storylines.

## User Study

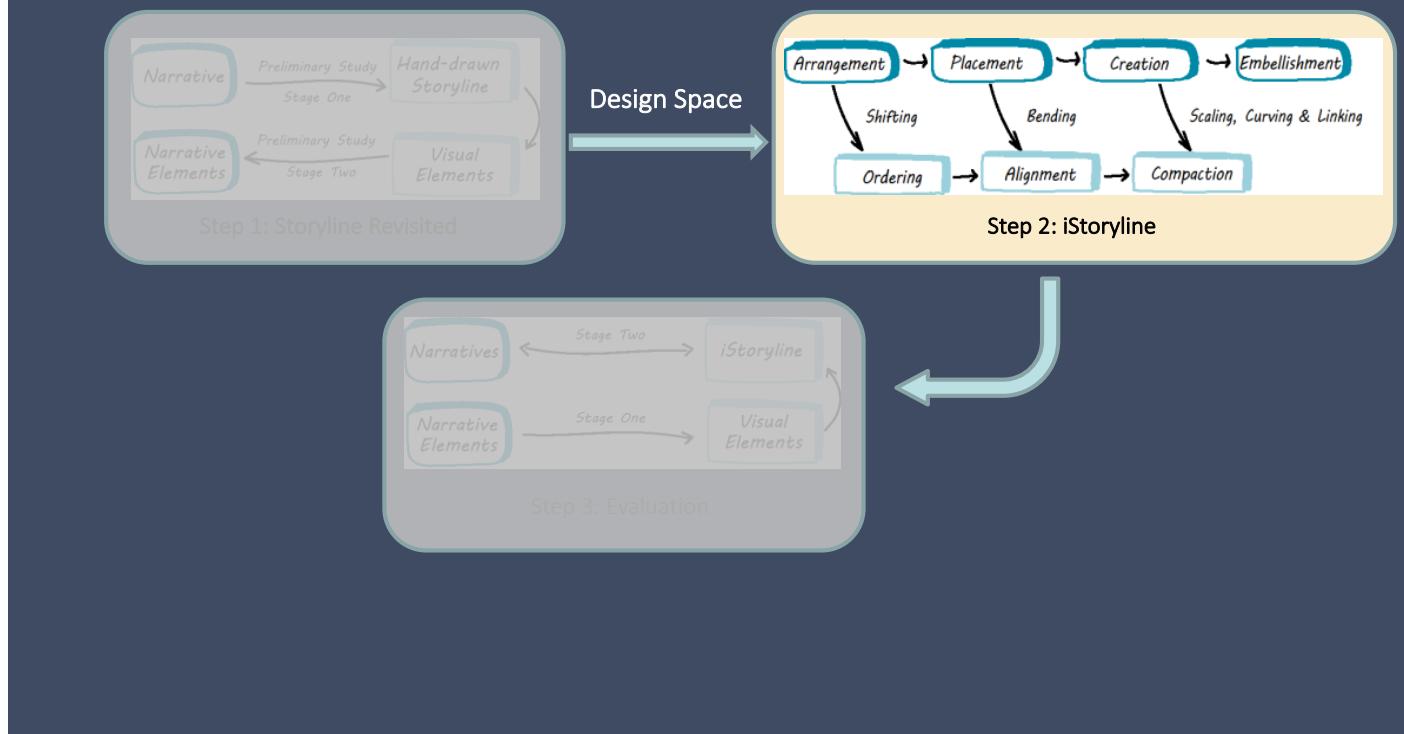
- We also collect quantitative data from the participants through comparison experiments.



■ Manually-drawn storylines  
■ Automatically-generated storylines



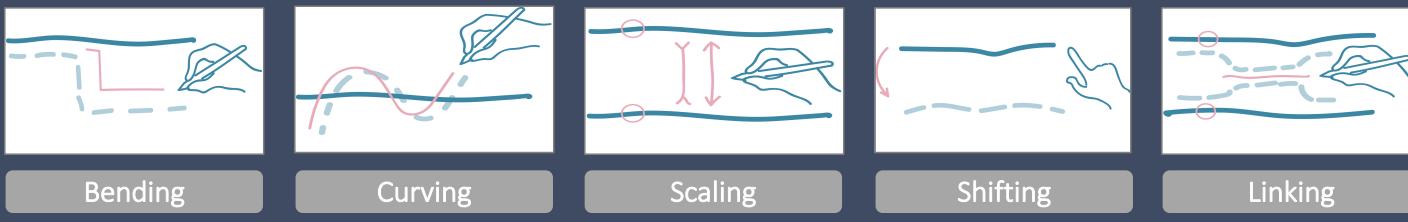
# iStoryline



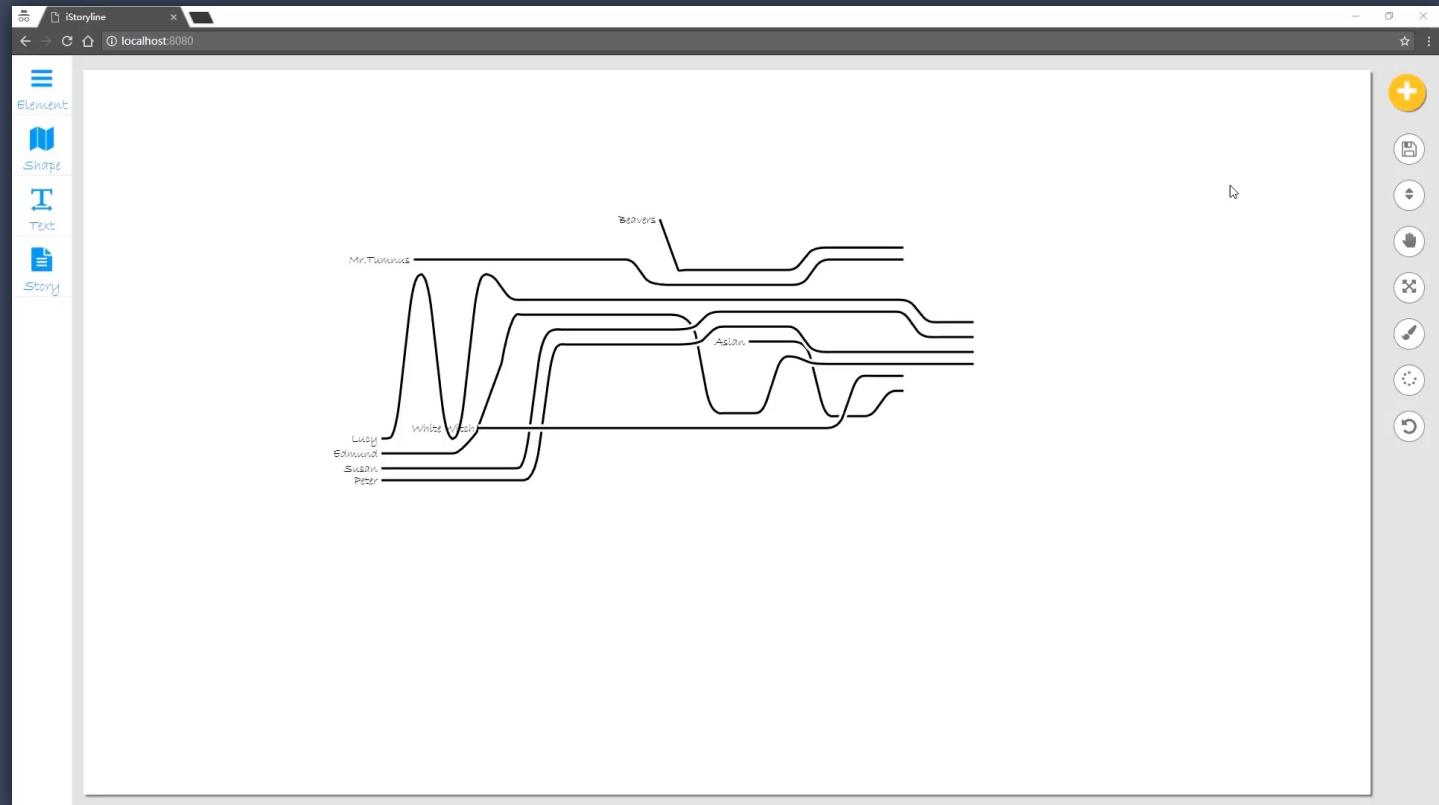
# iStoryline

- iStoryline is established on the state-of-the-art automatic method - StoryFlow.

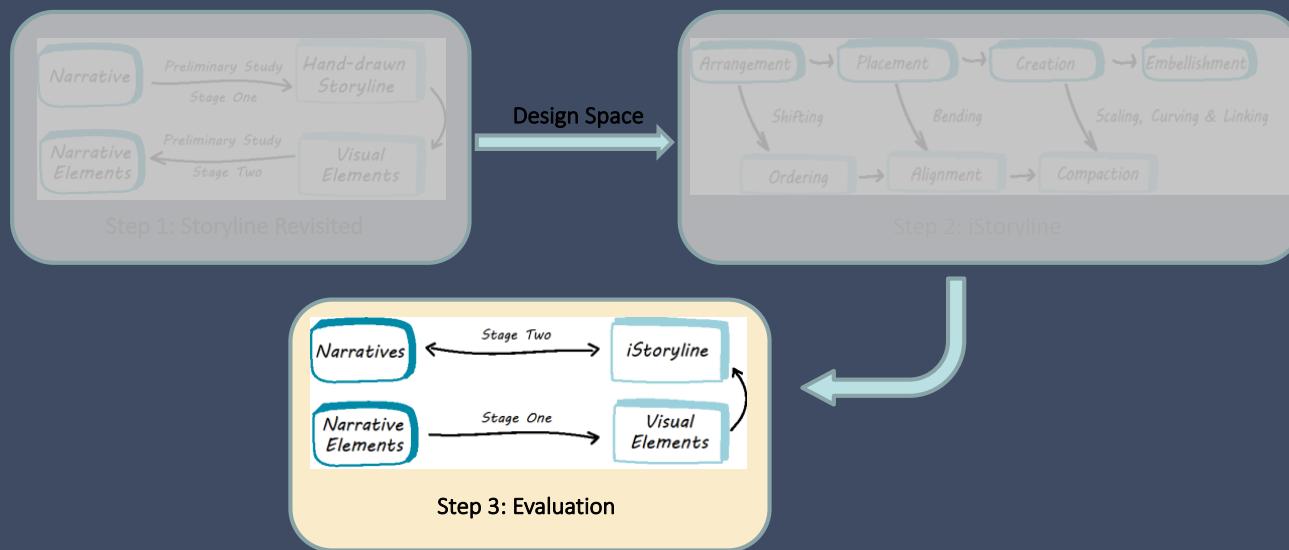
Interactions



# iStoryline: an authoring tool

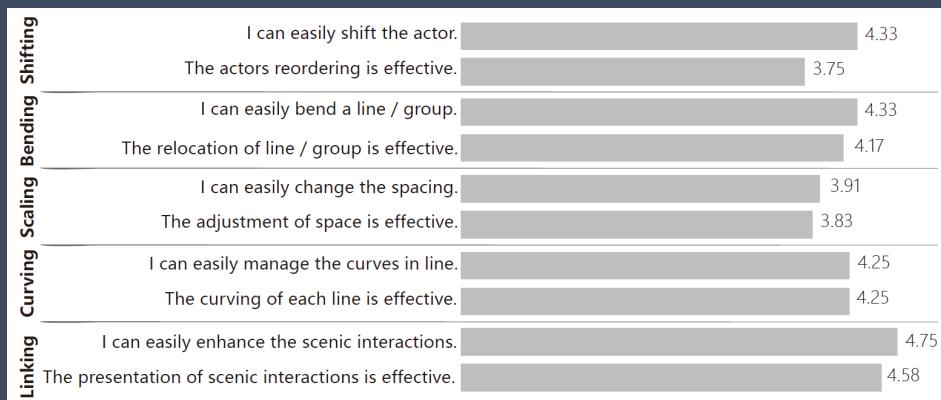


# Evaluation



## Stage one: Narrative elements -> Visual elements

- We conduct a task-based study to assess effectiveness and intuitiveness of iStoryline.
- 12 students (6 females)
- Results:



## Stage two: Visual elements <-> Narrative elements

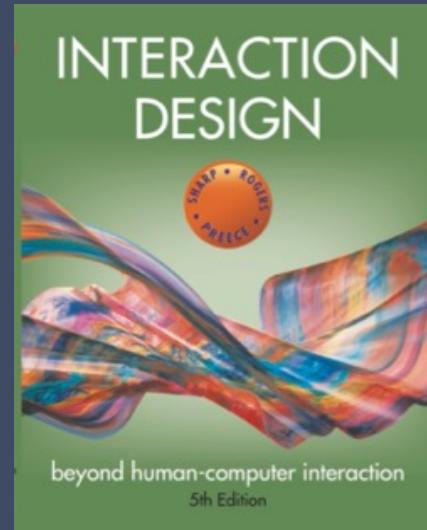
- We conduct an interviews with experts to compare the various interpretations of the iStoryline layout with the original narrative.
- Three experts: a professor (PD) in Industrial Design, a professor (PM) in Digital Media, and an advanced engineer (PE) from a leading e-commercial company.

## Tasks

- Tasks:
  - Given *four short narrative events* (by oral storytelling), *mark the corresponding visual elements* in the iStoryline layout.
  - Given *three visual elements* in the context of the whole iStoryline layout, discuss *the possible plots that may occur in the original narrative*.

## Reference

- Chapter 1, 2. “Interaction Design: Beyond Human-Computer Interaction” by Helen Sharp, Yvonne Rogers, and Jenny Preece



## Interactive Systems

- design life cycle as iterative process
- questions?