ARTIFACT-BASED COMPUTING & USER RESEARCH

TU WIEN

Design & Fabrication

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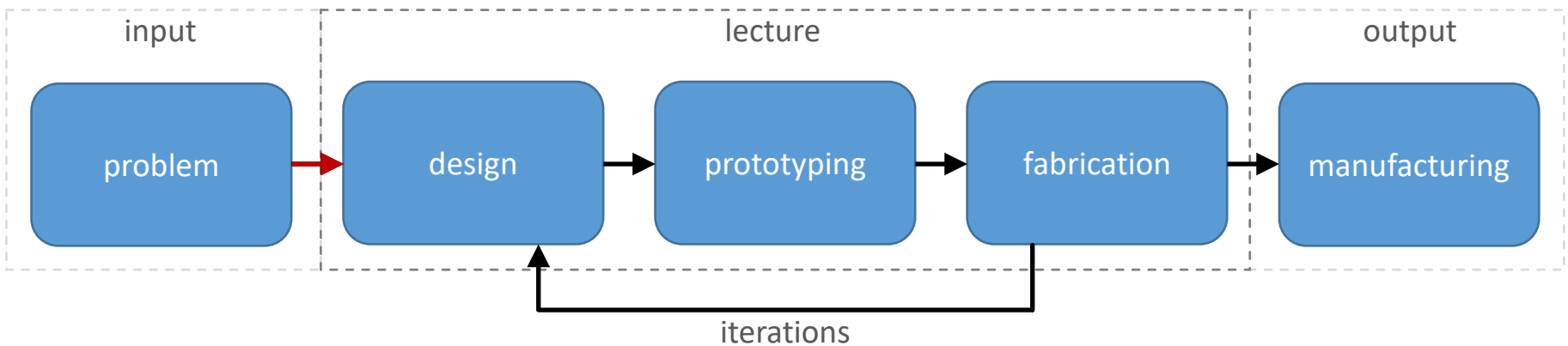
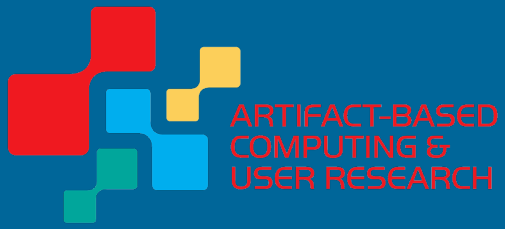
From Design to Fabrication

Recapitulation





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Lecture 2
Creativity, Art, and Design

Creativity, Art, and Design

Definitions – Art

Art

- Cultural artifact
- A form of human expression
- Provokes thought and emotional response
- Product of technical skills and creative thought
- Originated in inspiration and muse
- Intrinsic motivation

"The Kiss", Gustav Klimt (1907–08). https://en.wikipedia.org/wiki/Gustav_Klimt (accessed on 2023-10-04)

Creativity, Art, and Design

Definitions – Design

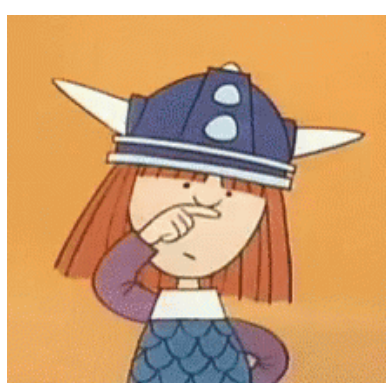
Design

- Based on a problem to solve
- Methodical and driven by a clear purpose
- Requires creativity
- Considers practicality and functionality
- Considers appeal, beauty, and aesthetics
- Extrinsic motivation

"Eclipse", Sakura Adachi, https://www.sakurah.net/portfolio_page/eclipse/ (accessed on 2023-10-04)

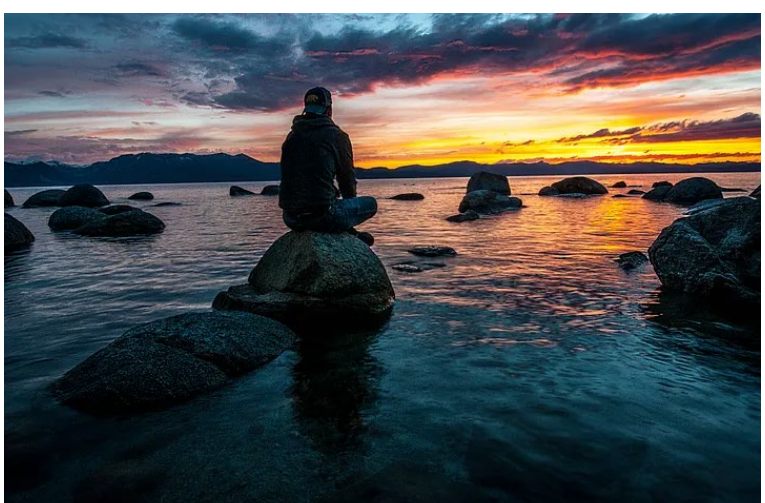
Creativity

- Complex process to generate something original, new, and valuable
- Involves the ability to think new and in unconventional ways
- Intangible: idea, scientific theory, musical composition, …
- Tangible: invention, painting, sculpture, …
- Serves as a means for creating art or developing a design
- Not a natural gift for everyone
- Creativity techniques as a systematic way to support the creativity process



"Vicke Viking", https://en.wikipedia.org/wiki/Vicke_Viking (accessed on 2023-10-11)
https://tenor.com/de/view/vicky-viking-vicky-the-viking-think-stars-gif-5370788 (accessed on 2023-10-11)

Creativity needs time, stillness, or even boredom!



https://bootcamp.uxdesign.cc/why-being-bored-is-good-for-your-creativity-37fd51c0f5e7 (accessed on 2023-10-11)

Design Principles

› Fundamental, systematic guidelines

› Set of considerations for the basis of a concept or product

Literature

› Lidwell et al. (2023), “Universal Principles of Design”, Quarto Publishing Group USA, ISBN 0-7603-7517-8, TU online library.

› Brignell et al. (since 2017), “Design Principles”, open source collection of design principles and methods, https://principles.design

https://principles.design/ (accessed on 2023-10-09)

KISS: Keep it Simple, Stupid (103)

› Simple systems tend to work better over the long term

› Minimal number of parts and interactions eases maintenance

› Assumes that the design process is inherently messy

› Complex systems are susceptible to bugs

› “Simplicity is about subtracting the obvious, and adding the meaningful.”, John Maeda

Lidwell et al. (2023), “Universal Principles of Design”.

Ockham's Razor (128)

› Principle to make informed decisions and avoid unnecessary complexity (e.g., conspiracy theories)

› The simplest explanation is usually the best one

› Given a choice between functionally equivalent designs, the simplest design should be selected

› "Everything should be made as simple as possible but not simpler.", Albert Einstein

Lidwell et al. (2023), "Universal Principles of Design".

Form Follows Function (075)

› Aesthetic considerations (e.g., shape of an object) should be secondary to functional considerations

› “Form ever follows function. This is the law.”, Louis Sullivan

Lidwell et al. (2023), “Universal Principles of Design”.

Do you know any other Design Principles?

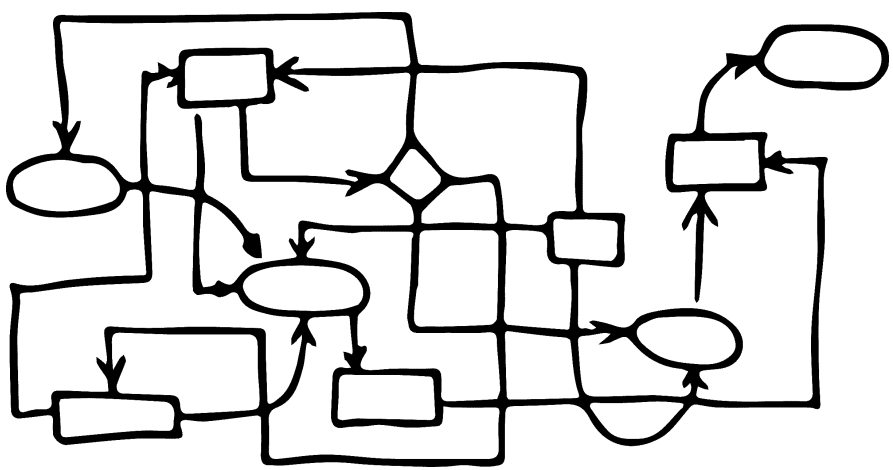
Which AI tools have you used so far?

What did you use these tools for?

Creativity, Art, and Design
Generative Algorithms

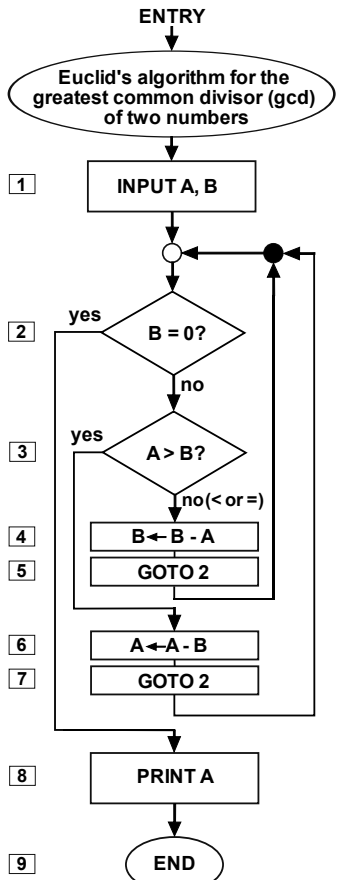
https://www.heise.de/news/Canva-Deutschland-Chef-Deutsche-sind-nicht-kreativ-und-lieben-deshalb-KI-9305217.html (accessed on 2023-09-15)

What is an algorithm?



Algorithm

- Mathematics and computer science
- Finite sequence of rigorous instructions
- Used to solve specific, complex problems or perform computations to accomplish tasks
- Step-by-step procedures
  - Well-defined and unambiguous steps
  - Finite number of steps, eventually terminating
  - Input will result in output



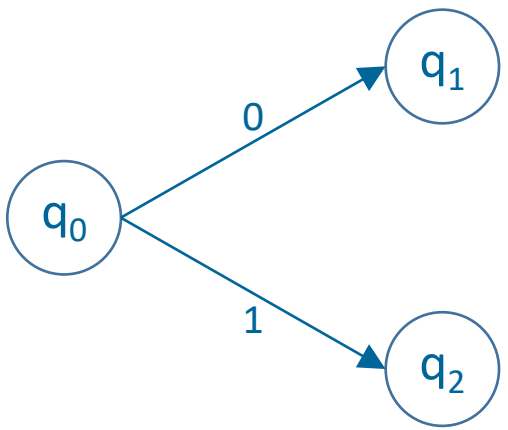
Euclidean algorithm to calculate the greatest common divisor

https://en.wikipedia.org/wiki/Algorithm (accessed on 2023-10-10)

Determinism

› Philosophy:
Events are completely determined by previously existing causes.

› Computer Science:
A particular input will always produce the same output, with the underlying machine always passing through the same sequence of states.
  › Problem precisely solvable in polynomial time
  › Well-determined worst-case time complexity



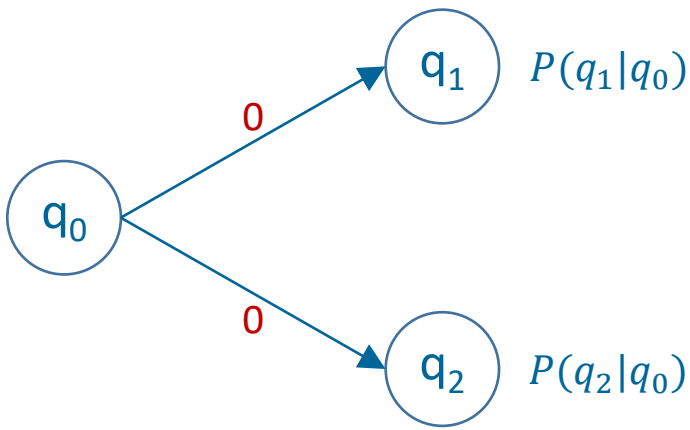
https://en.wikipedia.org/wiki/Determinism and https://en.wikipedia.org/wiki/Deterministic_algorithm (accessed on 2023-10-10)

Indeterminism

› Philosophy:
Events are not deterministically caused but rather occur due to chance.

› Computer Science:
No event is certain and the entire outcome of anything is probabilistic.

- The same input produces different outputs due to preconditions, system states, random events, …
- Used to approximate solutions of problems
- Time complexity is usually described as the expected run time of the algorithm

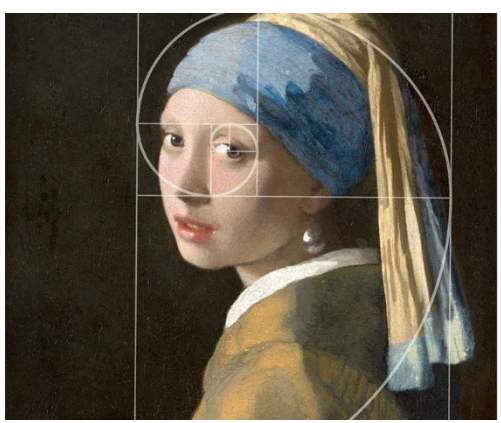


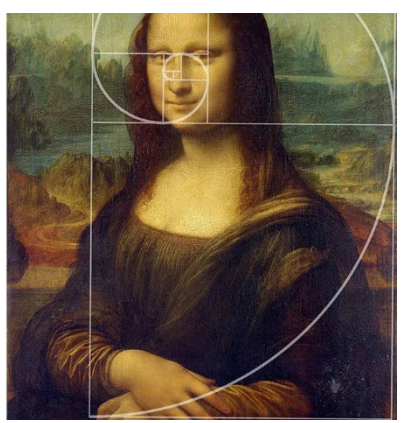
https://en.wikipedia.org/wiki/Indeterminism and https://www.geeksforgeeks.org/difference-between-deterministic-and-non-deterministic-algorithms/ (accessed on 2023-10-10)

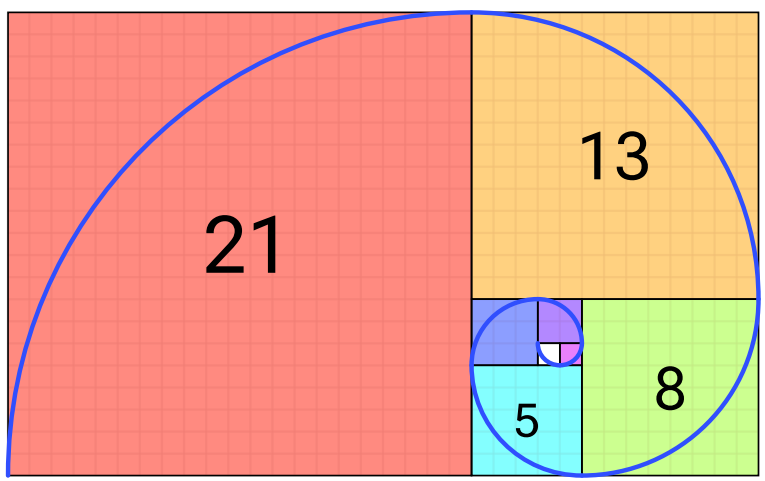
Generative Algorithms

› Visible in nature

› Noticeable in aesthetics







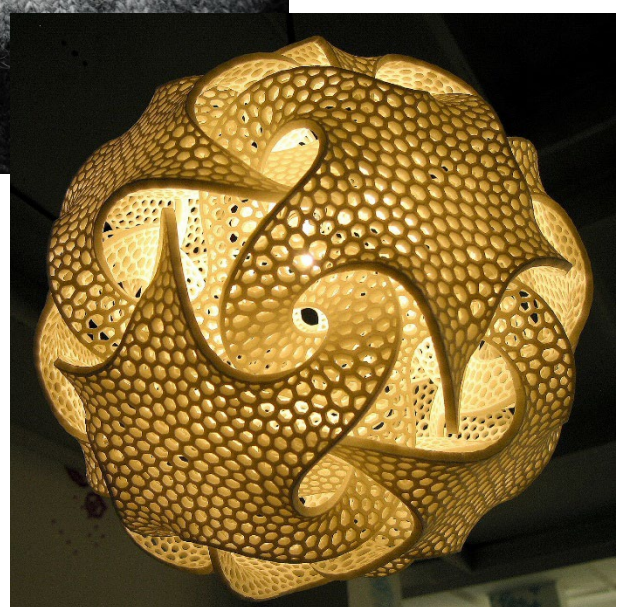
Golden Spiral & Fibonacci Sequence:

$F_0 = 0,\ F_1 = 1,\ F_n = F_{n-1} + F_{n-2}$

https://en.wikipedia.org/wiki/Golden_ratio , https://memolition.com/2014/07/17/examples-of-the-golden-ratio-you-can-find-in-nature/ , and https://www.oldtowngallerybangkok.com/news/a-bit-of-history-about-the-golden-ratio-and-rule-of-thirds (accessed on 2023-10-10)

Generative Algorithms

- Visible in nature
- Apparent in aesthetics
- Parallels in geometric and algorithmic patterns
  - Examples: Knitting/crochet, hyperbolic structures, …



Adobe Stock: 466013159 , https://en.wikipedia.org/wiki/Bathsheba_Grossman (accessed on 2023-10-10)

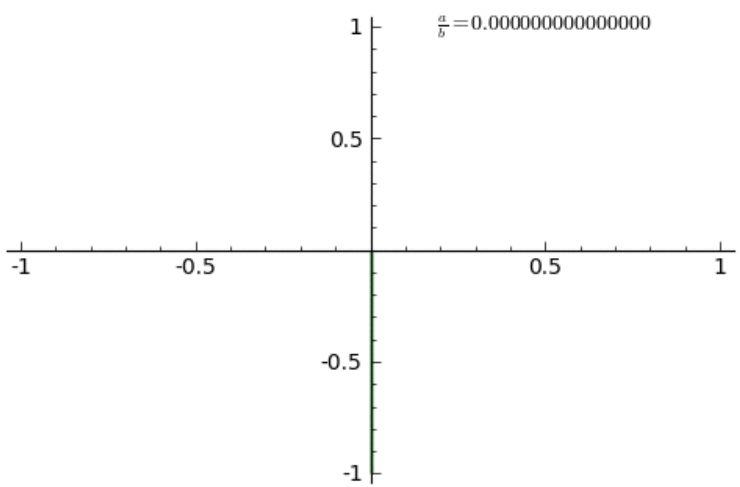
Are computers creative?

Creativity, Art, and Design
Generative Algorithms

Deterministic

› Fractal patterns

› Lissajous figures



https://en.wikipedia.org/wiki/Mathematics_and_art , https://en.wikipedia.org/wiki/Fractal , https://en.wikipedia.org/wiki/Lissajous_curve (accessed on 2023-10-09)

Creativity, Art, and Design

Generative Algorithms – Deterministic

https://n-e-r-v-o-u-s.com/projects/albums/dress-in-motion/ (accessed on 2023-10-09)

Is this creativity?

Indeterministic

› Noise and random patterns

› Probabilistic algorithms and machine learning

Creativity, Art, and Design

Generative Algorithms – Indeterministic AI

Zalando Muze (2017)

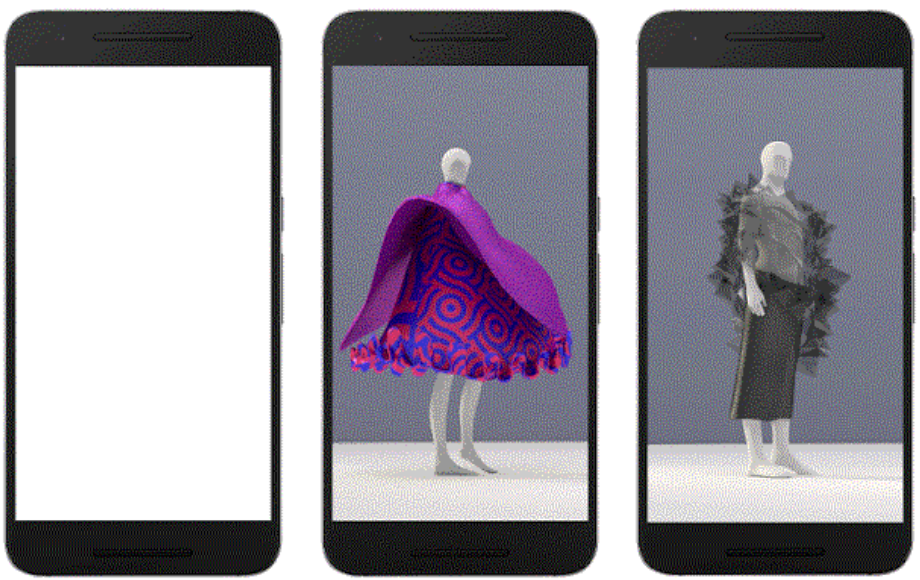
- 50,000 collected samples from 600 fashion enthusiasts
- 40,424 outfits generated within a single month

"Sketches that respond perfectly to the tastes and styles of consumers."

ELLE

"Karl Lagerfeld and John Galliano need to be brave now."

WIRED



https://blog.google/around-the-globe/google-europe/project-muze-fashion-inspired-by-you/ (accessed on 2023-10-09)

Creativity, Art, and Design

Generative Algorithms – Indeterministic AI

“Fast” Fashion

https://thenewblack.ai (accessed on 2023-10-09)

Creativity, Art, and Design

Generative Algorithms – Indeterministic AI

Product Design

https://thenewblack.ai (accessed on 2023-10-09)

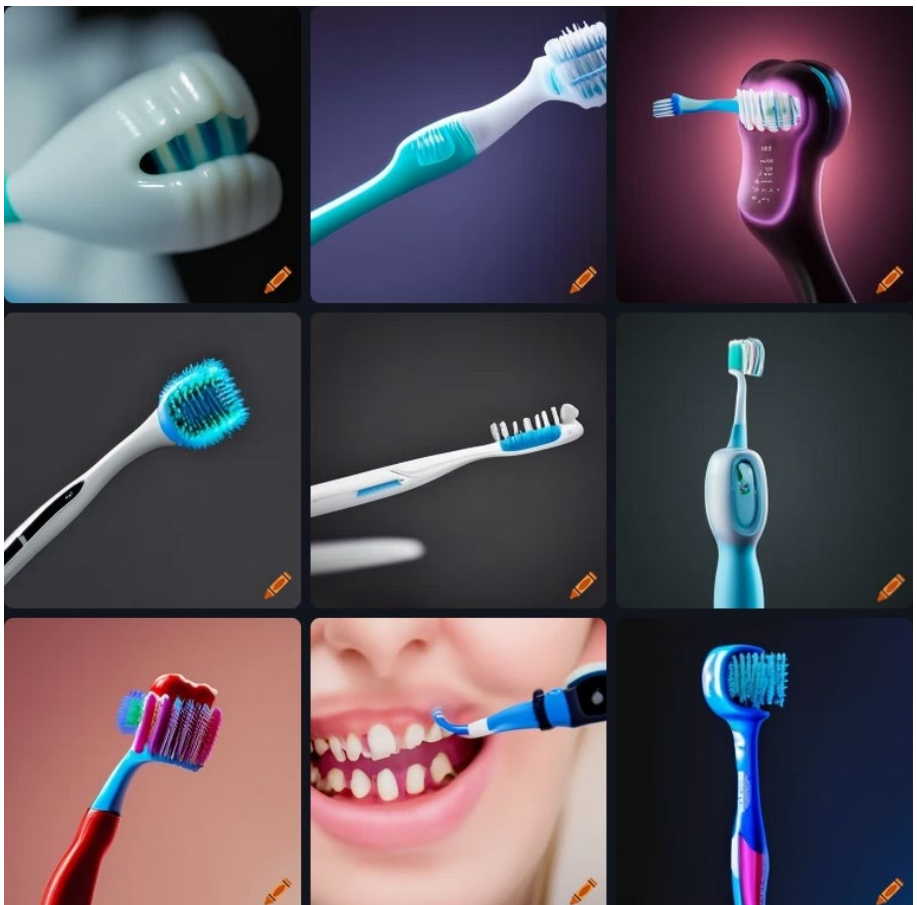
Creativity, Art, and Design

Generative Algorithms – Indeterministic AI

Prompt:
"A smart toothbrush that shows the quality of the teeth by means of an LED light."

Year:
2023

Platform:
https://www.craiyon.com



https://www.craiyon.com (accessed on 2023-10-09)

Creativity, Art, and Design

Generative Algorithms – Indeterministic AI

Prompt:
"A smart toothbrush that shows the quality of the teeth by means of an LED light."

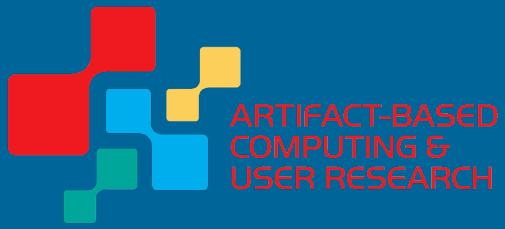
Year:
2024

Platform:
https://ideogram.ai

https://ideogram.ai (accessed on 2024-10-05)

Creativity, Art, and Design
Questions?

What are your questions?



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Project
Organization

Project
Organization and Requirements

Organization

› Group submission (4 members) (higher demands for 5 members)

› Three submissions:

› Concept:	video submission (5 min),	October 29, 2024
› Prototyping:	video submission (5 min),	December 03, 2024
› Final Presentation:	submission	January 21, 2025
Session 1	in class (5 min + 5 min Q&A),	January 22, 2025
Session 2	in class (5 min + 5min Q&A),	January 29, 2025

Session assigned at random! No changes allowed after submission.

Project
Organization and Requirements

Requirements

- Formal criteria:
  - Following the guidelines
  - Appropriate volume of submission
  - Appropriate writing / presentation style
- Deliverable:
  - Concept and creativity
  - Rationale of decisions and choices
  - Stringency and consistency
  - Feasibility
  - Features and implementation
- Allocation of Work (e.g. as a text file)
  - Which tasks were taken over by whom?
  - Can be a single sentence per group member

Project
Organization and Requirements

Requirements

› The project prompt will be unveiled in the Tutorial Session today!

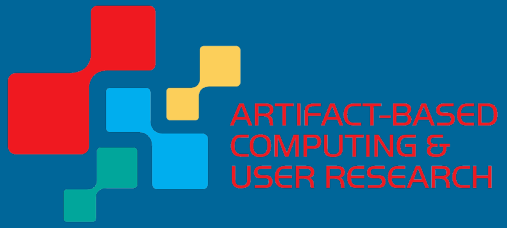
› Expectations
  › Semi-functional prototype, “advanced” mockup
  › “Mechanical Turk” or “Wizard of Oz”
  › Demonstrate proof-of-concept characteristics
  › Should involve both housing and electronics

https://en.wikipedia.org/wiki/Mechanical_Turk and https://en.wikipedia.org/wiki/Wizard_of_Oz_experiment (accessed on 2023-10-10)

Example of “The Most Useless Machine”, https://www.youtube.com/watch?v=3ojhZaP5_JI (accessed on 2023-10-10)

Project
Questions?

What are your questions?



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Tutorial

Creativity Techniques

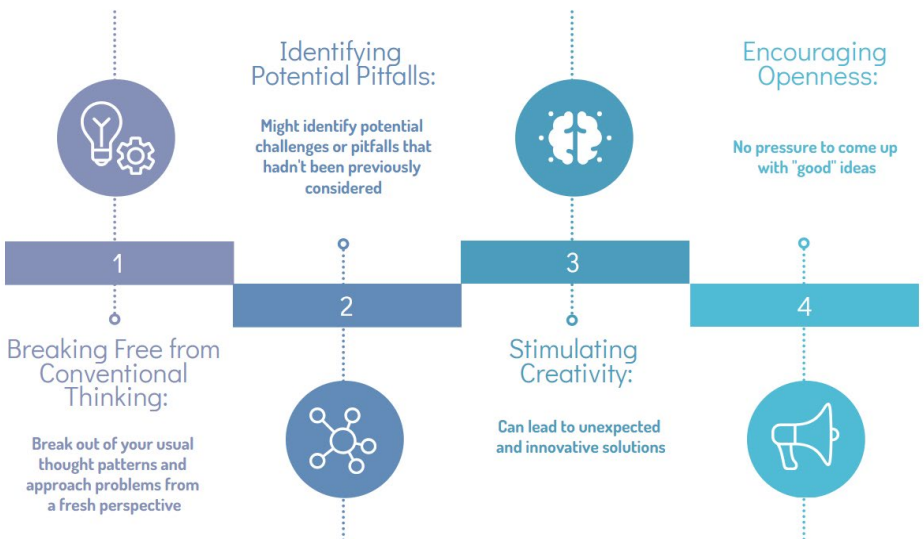
Creative Thinking Techniques

Worst Possible Idea

“Inverted” search process

Worst Possible Idea

Encourages to come up with the most terrible, or impractical solutions



- Think of the most terrible solutions you can imagine
- Elements of these bad ideas can be flipped or tweaked to become innovative solutions
- Take a promising idea - refine it

Prompt

What would be the worst trash bin design that guarantees to spill garbage?

Timer

05:00

Project Prompt

How can we modify an ordinary tool or prop to be smart?

Mash-up Method

Creativity by Merging Ideas

Mash-up Scenarios

- Select two items
  - First an ordinary tool or prop
  - Second a technology (e.g., AR/VR, GPS, or LLM)
- Consider how these two items could be combined to create a new 'smart' version of the tool or prop.
- Brainstorm potential 'smart' features.
- Focus on thinking creatively and coming up with fun and unexpected ideas.

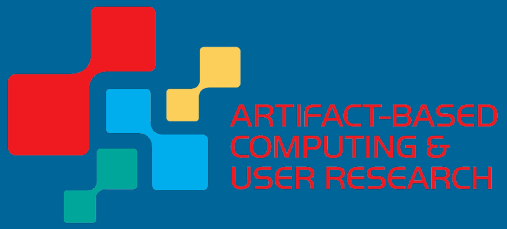
Example Scenario

Haptic shoes for VR hiking experience that let you feel different terrains.

Timer

10:00

Scan to navigate to the online whiteboard



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Exercise 1

Announcement

Exercise 1: Creativity Techniques

Individual Submission, due date is Tuesday, October 22, 2024 until 23:59h

Group Work

- Create a shared online Microsoft Whiteboard with your group
- Copy the template shared during the lecture to your group's Whiteboard
- Schedule an in-person meeting or online call to collaborate on the exercise
- Discuss Verplank's Sketching and perform SCAMPER Brainstorming

Alternatives to Microsoft Whiteboard are Google Jamboard, Miro, or FigJam.

Individual Deliverables

- Reflect on the discussions in your group sessions
- Based on your own understanding and perspective, individually submit the deliverables of Exercise 1

Exercise 1: Generative AI

Use any generative AI tool or service you like.

Below are some of our suggestions:

- Free credit limit: https://ideogram.ai , midjourney or nightcafe or https://www.dall-efree.com
- Entirely free: https://www.craiyon.com
- Paid: ChatGPT

Prompt: Can you give me a picture of a smart hat that people can wear on a daily basis?

GPT-4o response:

Ideogram.ai response:

Exercise 1: Submission

1. Verplank's sketch (4 points)
   - Submit your individual drawing
   - Must be clear, labeled, and easy to understand
   - Only manual or digital hand drawings are accepted - no icons or generated images
   - No judgment or point deduction on drawing skills

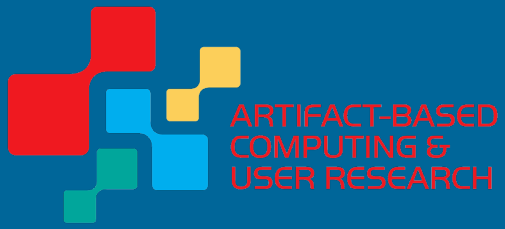
2. SCAMPER (4 points)
   - Submit an image or readable screenshot of your SCAMPER brainstorm from the group session
   - Completed SCAMPER template

3. Generative AI (1 point)
   - Submit your prompt and image output

4. Short reflection (1 point)
   - Your understanding (Verplank's Sketching, SCAMPER Brainstorming, and Generative AI)
   - Your experience and knowledge gathered
   - Topics where you need further clarification
   - Learning process, challenges faced, and insights gained
   - This reflection must not exceed one page

- Deadlines are strict! Late submissions are not considered.

Thank You!



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Project

Announcement

Project Milestone 1: Concept Submission

Group Submission, due date is Tuesday, October 29, 2024 until 23:59h

Video Submission (10 points)

- Present a clear project concept - give your project a relevant yet catchy name
- Describe your idea - smart modification of your selected tool or prop
- How it supports the user - what benefits the user receives
- Communicate your process (Verplank's Sketching and SCAMPER brainstorming) and group efforts effectively
- The video must be no longer than five minutes
- Note: Storytelling keeps your audience engaged, supported by visuals like slides or images

Paper/Cardboard Prototype (8 points)

- Provide at least one photograph of the paper/cardboard prototype (crafted material)
- You submit a one-page *.pdf description of how the paper cardboard prototype was conceptualized with at least one photo of your paper/ cardboard prototype.
- A brief description must contain:
  - Brief description of the final concept and key features
  - How the group brainstormed, discussed, and reached a common consensus
  - Revisions that were made through group feedback and refinement

Reflection (2 points)

- A brief account of your understanding, experience, knowledge, learning process, challenges faced, and insights gained on the task and the process, submitted as a group
- Must also outline the allocation of work for each group member
- This reflection must not exceed one page

- Deadlines are strict! Late submissions are not considered.

Thank You!

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