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It Is Your Turn: Collaborative Ideation with a Co-Creative Robot through Sketch

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THE ACM **CHI** CONFERENCE ON HUMAN FACTORS IN COMPUTING SYSTEMS IS THE PREMIER INTERNATIONAL CONFERENCE OF *HUMAN-COMPUTER INTERACTION*.

CHI – PRONOUNCED ‘KAI’ – IS A PLACE WHERE RESEARCHERS AND PRACTITIONERS GATHER FROM ACROSS THE WORLD TO DISCUSS THE LATEST IN **INTERACTIVE TECHNOLOGY**.

WE ARE A MULTICULTURAL COMMUNITY FROM HIGHLY DIVERSE BACKGROUNDS WHO TOGETHER INVESTIGATE NEW AND CREATIVE WAYS FOR PEOPLE TO INTERACT

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IN THIS PAPER, WE ENVISIONED THE POSSIBILITY OF **A CO-CREATIVE ROBOT** THAT CAN **ITERATIVELY IDEATE WITH HUMAN BY GENERATING CREATIVE AND DIVERSE SKETCHES AND PRESENTED COBBIE.**

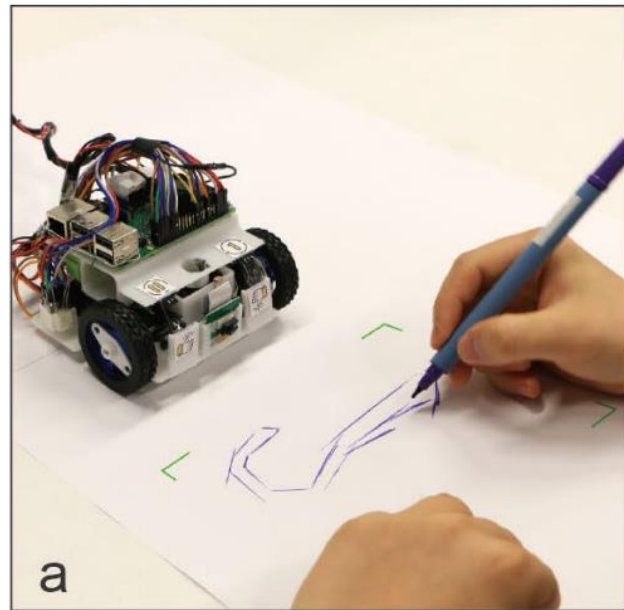
PROPOSE –

(1) **THE INTERACTION, INSPIRATION MECHANISM AND MOBILITY SYSTEM.**
& A COMPARATIVE STUDY IS A WEB-BASED CO-CREATIVE AGENT.

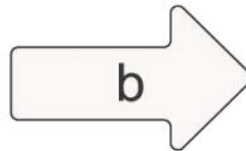
(2) **THE QUANTITATIVE AND QUALITATIVE** THAT COBBIE PERFORMS BETTER IN PROVOKING EXPLORATORY THINKING AND ENGAGING DESIGNERS IN COLLABORATIVE IDEATION,

THE TANGIBLE AND EMBODIED ROBOTS IN HUMAN AI COLLABORATIVE SYSTEM DESIGN.

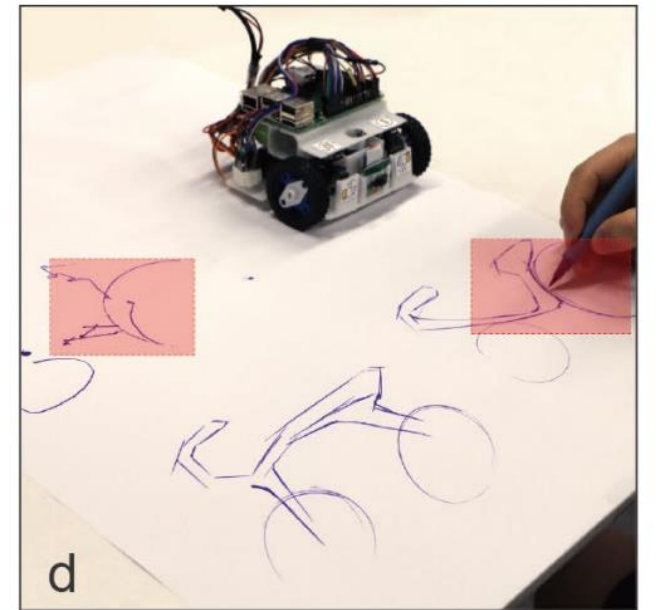
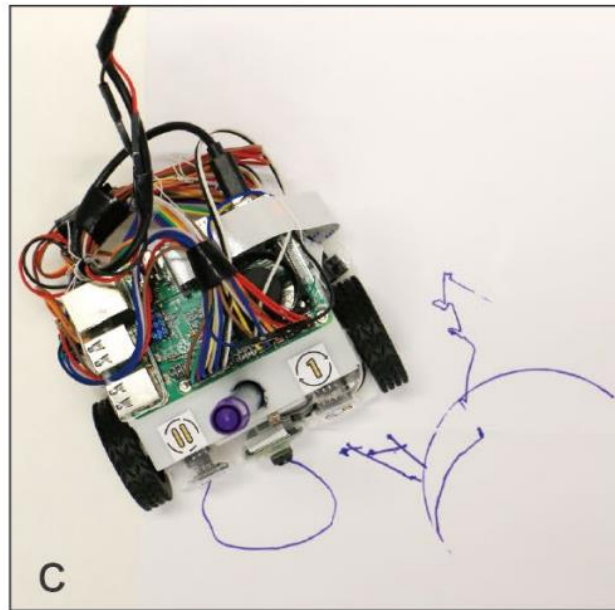
It Is Your Turn: Collaborative Ideation with a Co-Creative Robot through Sketch

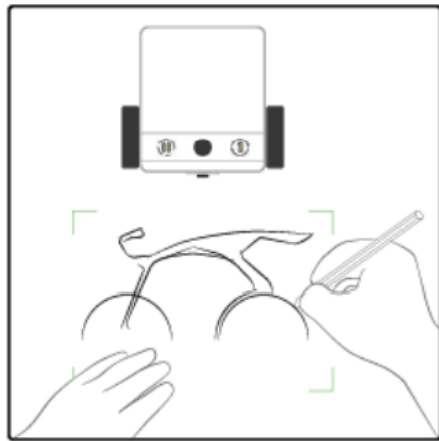


CONCEPTUAL
SHIFT

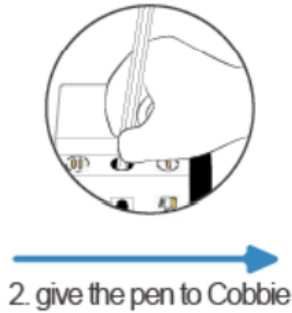


SKETCH-RNN

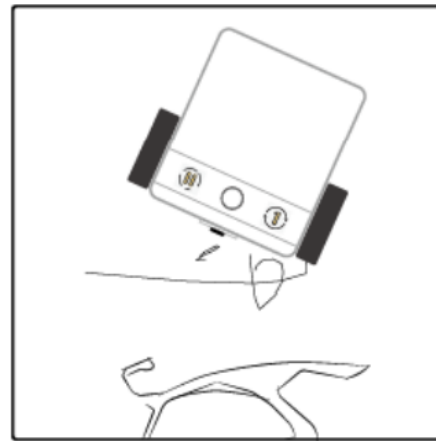




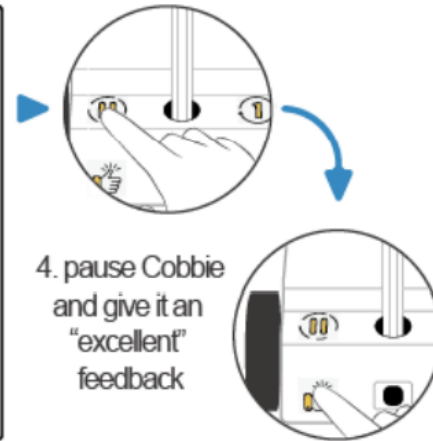
1. the user sketches on paper



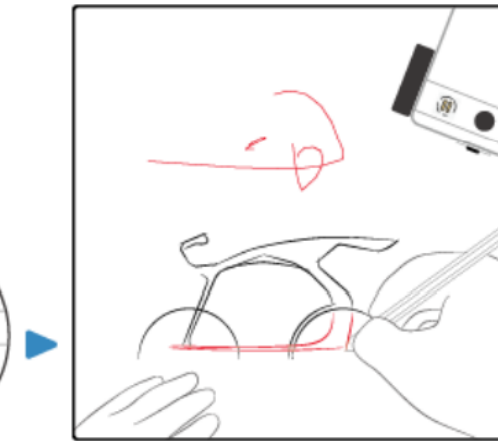
2. give the pen to Cobbie



3. Cobbie draws on paper



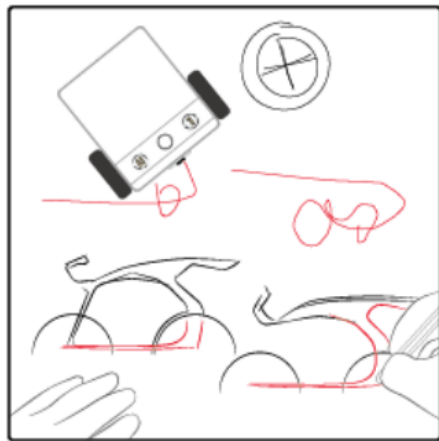
4. pause Cobbie and give it an "excellent" feedback



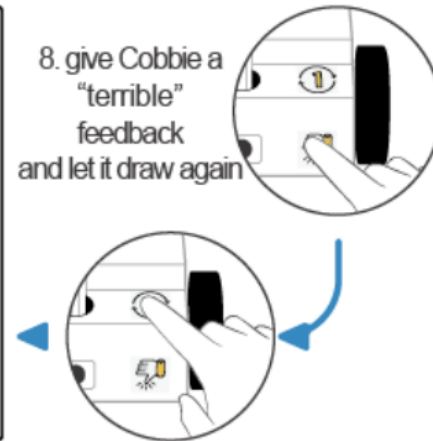
5 the user draws based on Cobbie's idea



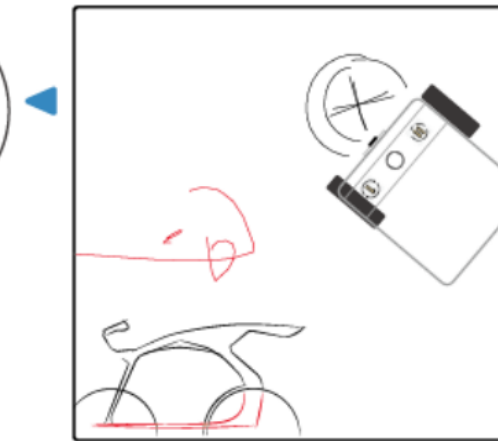
6. give the pen to Cobbie



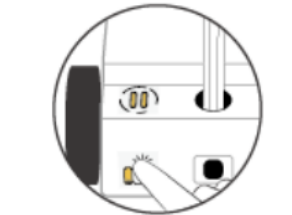
7. Cobbie draws again



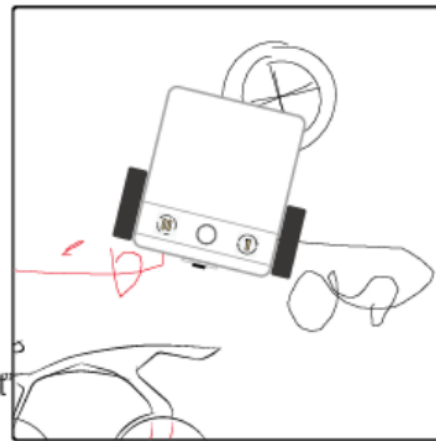
8. give Cobbie a "terrible" feedback and let it draw again



9. Cobbie draws again



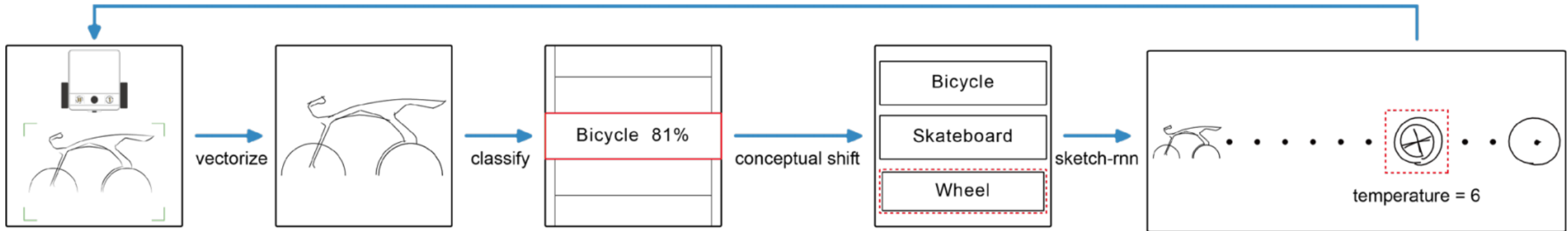
10. give Cobbie an "excellent" feedback

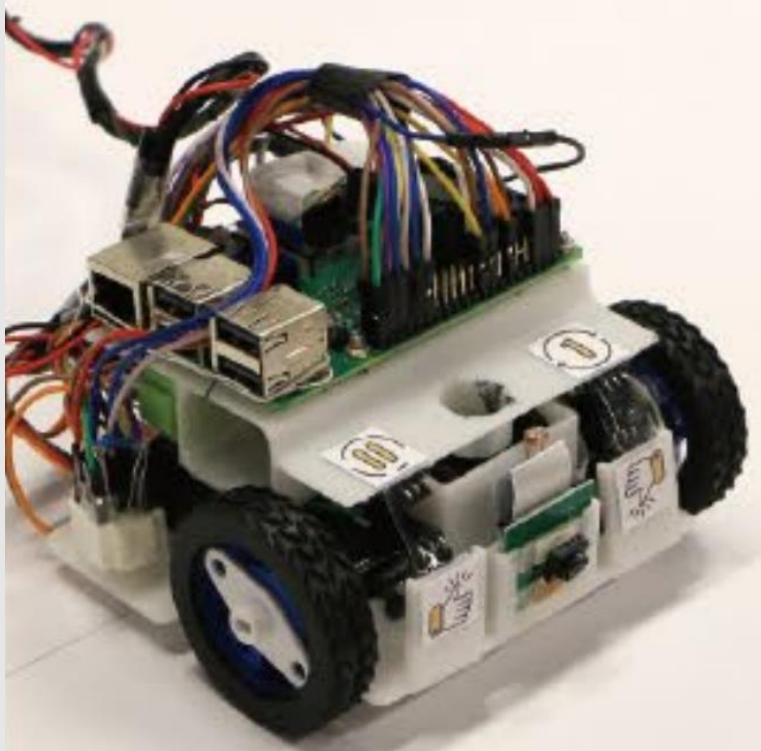


11. the user draws another sketch

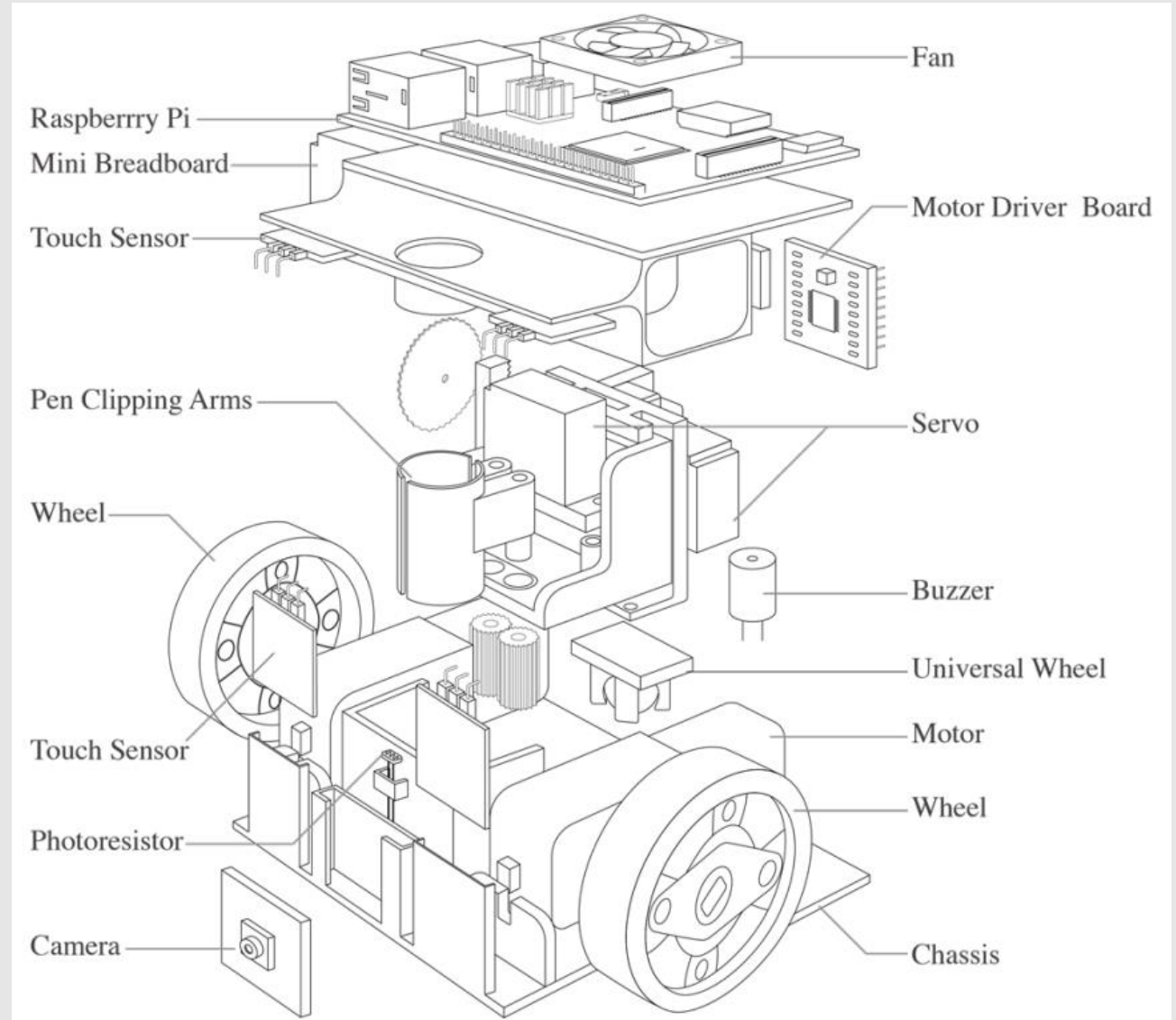
An example workflow of user-robot co-creation

Algorithms of Idea Generation Method

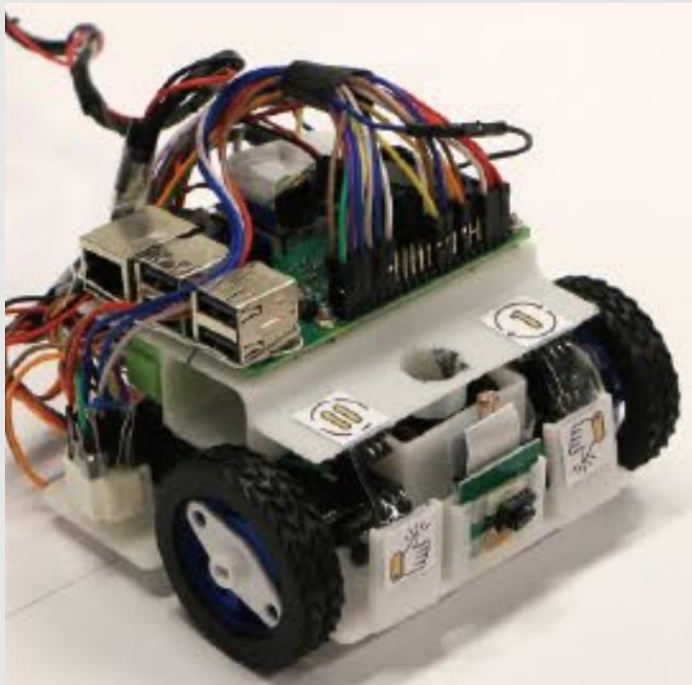




Exploded view of Cobbie



Cobbie



Robot

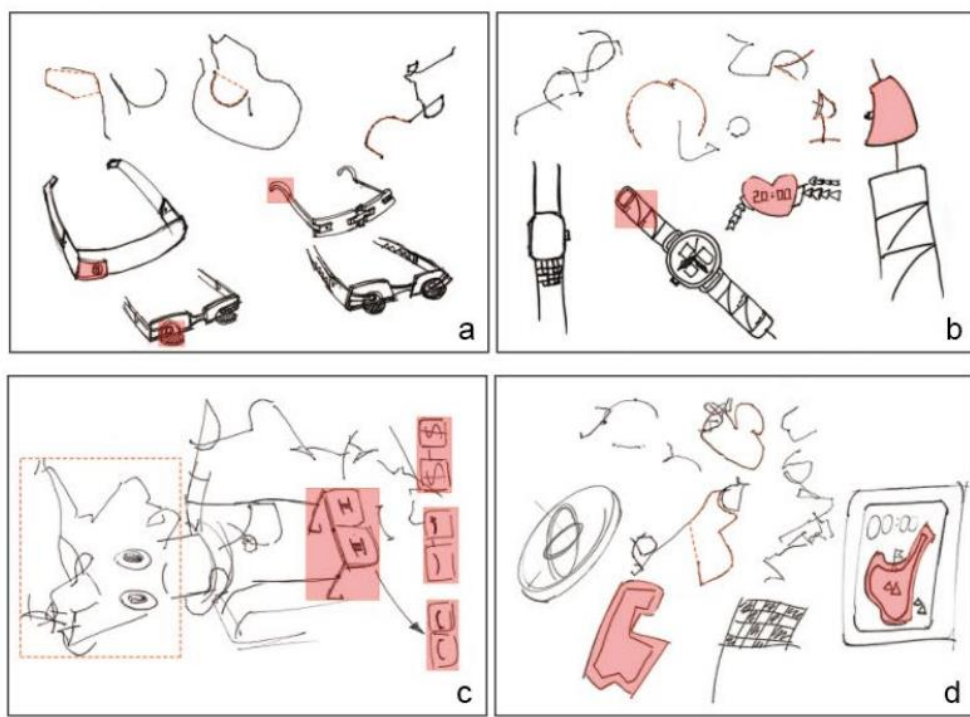
Cogent



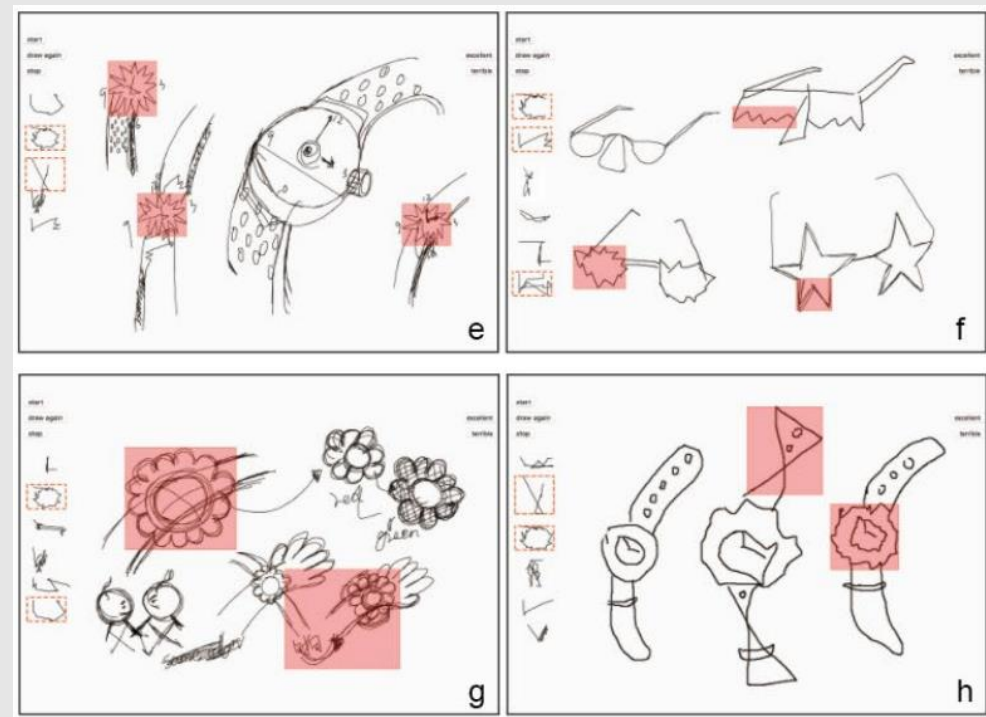
2020/12/28

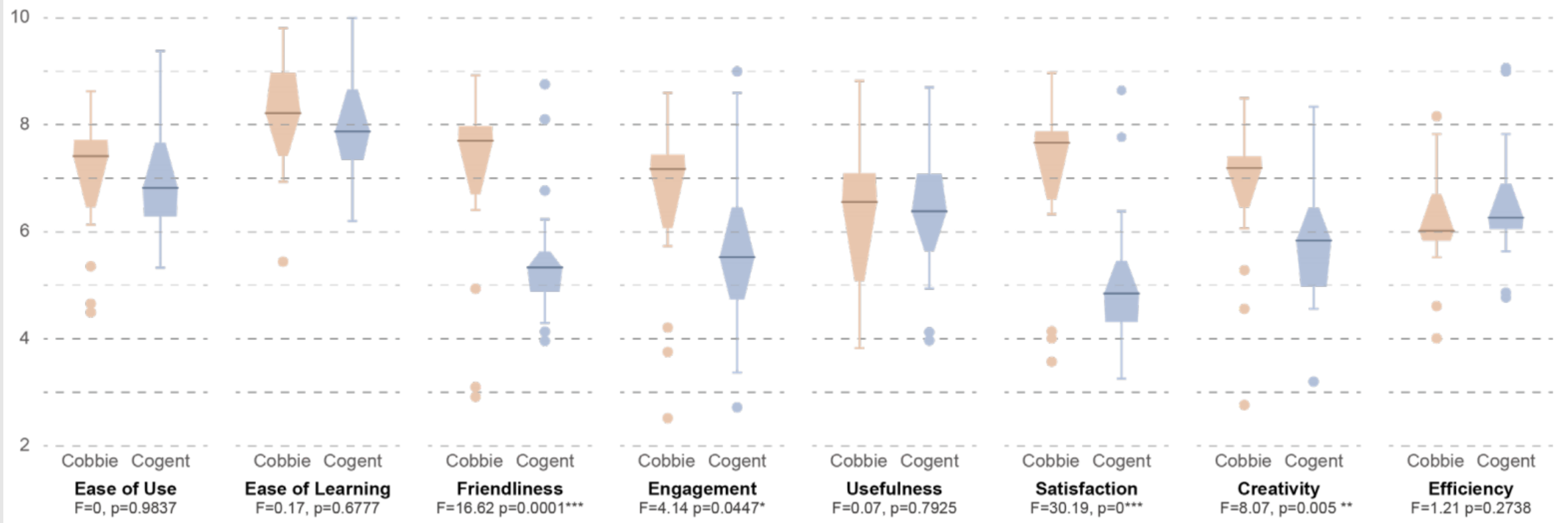
V.S.

Cobbie



Cogent





A VAS(Visual analog scales)scale to quantitatively evaluate Cobbie and Cogent from 8 dimensions:

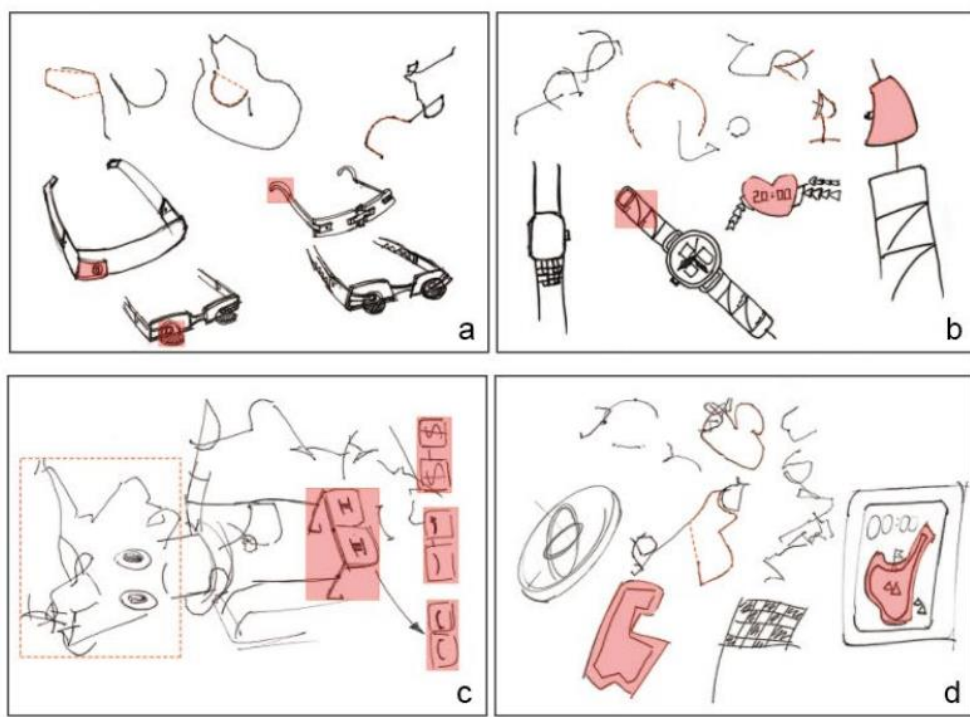
Experience

- 1) Ease of use,
- 2) Ease of learning,
- 3) Friendliness,
- 4) Engagement

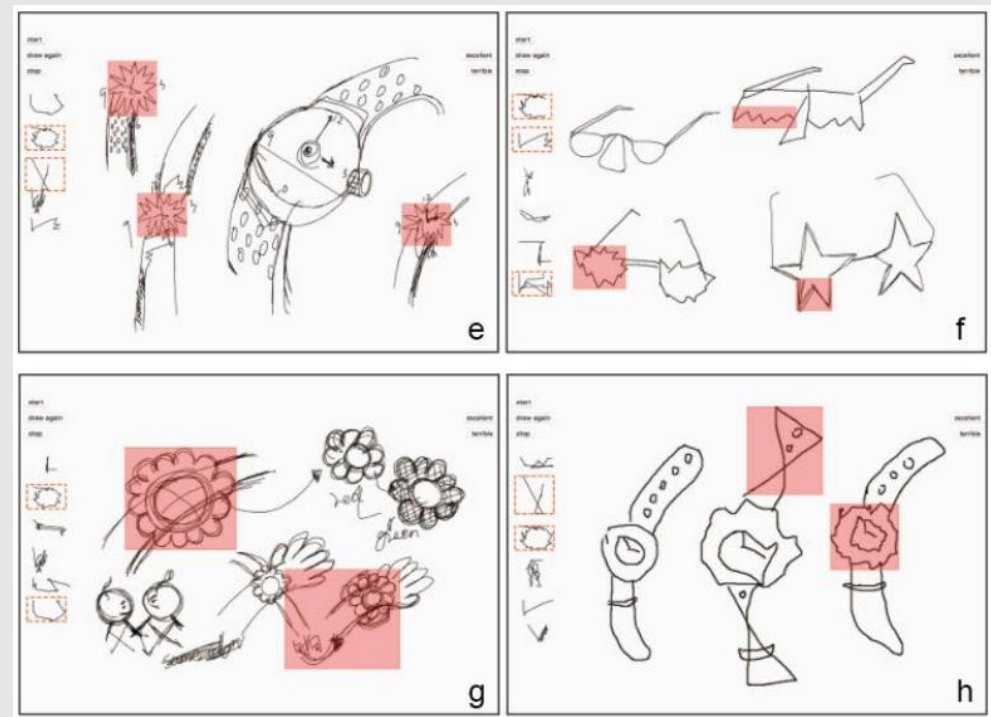
Creativity

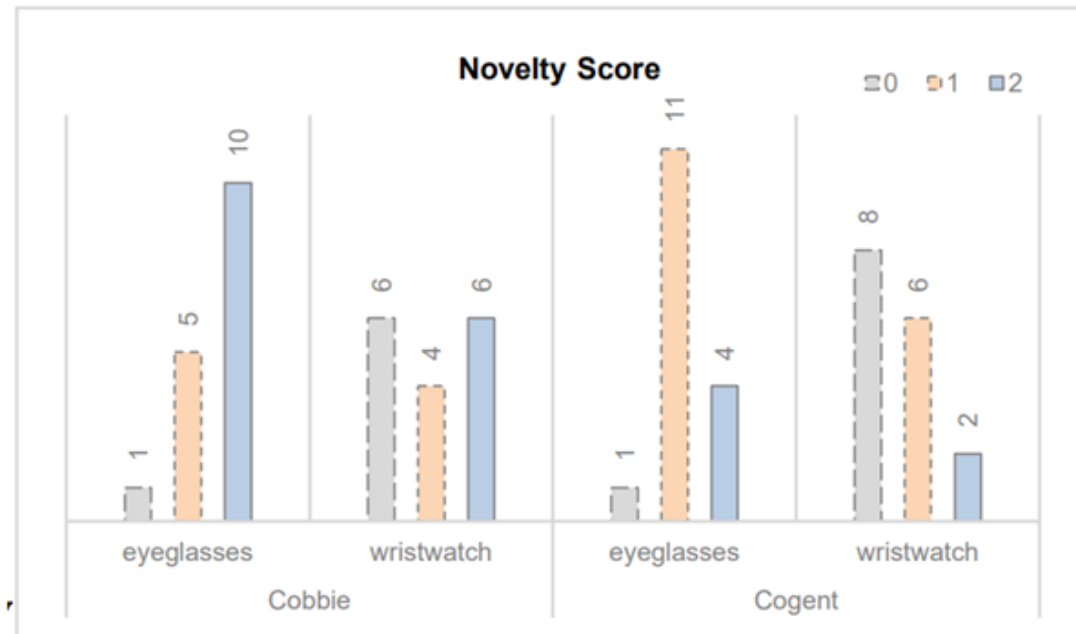
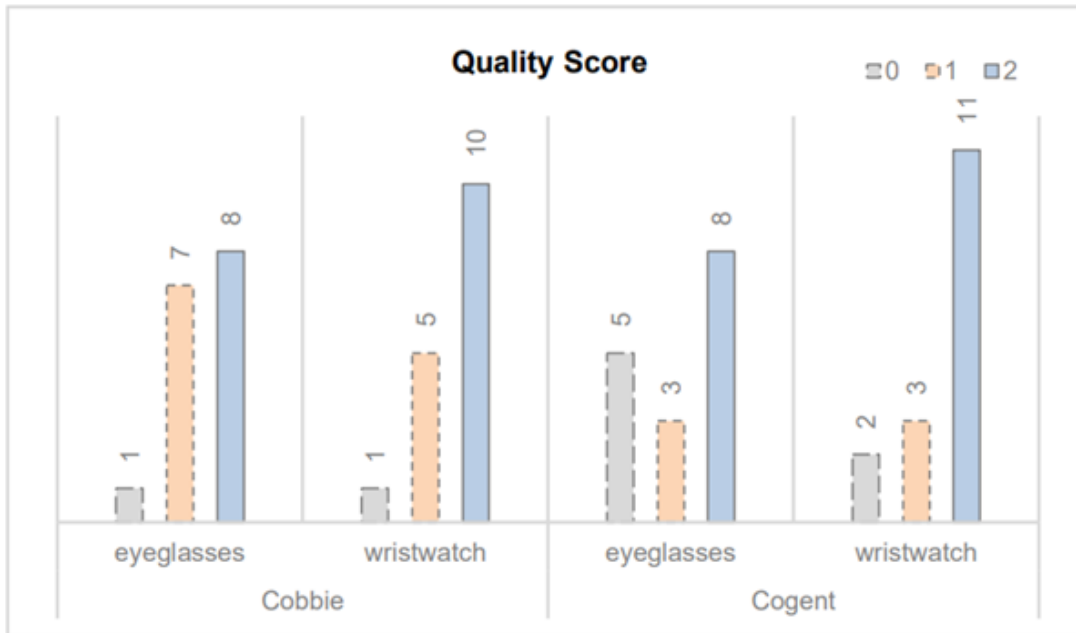
- 5) Usefulness (of the inspirations)
- 6) Satisfaction (of the quality of design outcomes)
- 7) Creativity, and
- 8) Efficiency.

Cobbie



Cogent





ID	Age	Gender	Area of design	Years of practice	Education
P1	24	M	Industrial	5	MA
P2	25	M	Industrial, Graphic	7	MA
P3	30	M	Industrial, Engineer	5	PhD
P4	21	M	Industrial	2	MA
P5	29	F	Industrial, Interaction	8	PhD
P6	22	M	Interaction	4	MA
P7	23	M	Interaction	4	MA
P8	22	F	Industrial, Interaction	4	MA
P9	24	M	Graphic	6	MA
P10	24	M	Industrial	5	MA
P11	24	F	Industrial, Interaction	5	MA
P12	24	F	Graphic, Interaction	5	MA
P13	24	F	Industrial, Interaction	5	MA
P14	23	M	Industrial	2	MA
P15	24	M	Interaction	2	MA
P16	22	M	Industrial, Interaction	5	MA

0 poor,
 1 ordinary,
 2 optimal degrees.



WHAT YOU LEARN??



WHAT I LEARN?

Summary: What I learned from this paper?

- Paper: CHI-ACM , Creativity and cognition- ACM,
- Statistics: Survey methodology to address the research
- CV: computer vision
- NN: RNN sketch
- Interactive (Robot/Machine)