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An Eye Pupil Detection-Based Review Support System for Online Video-based Learning

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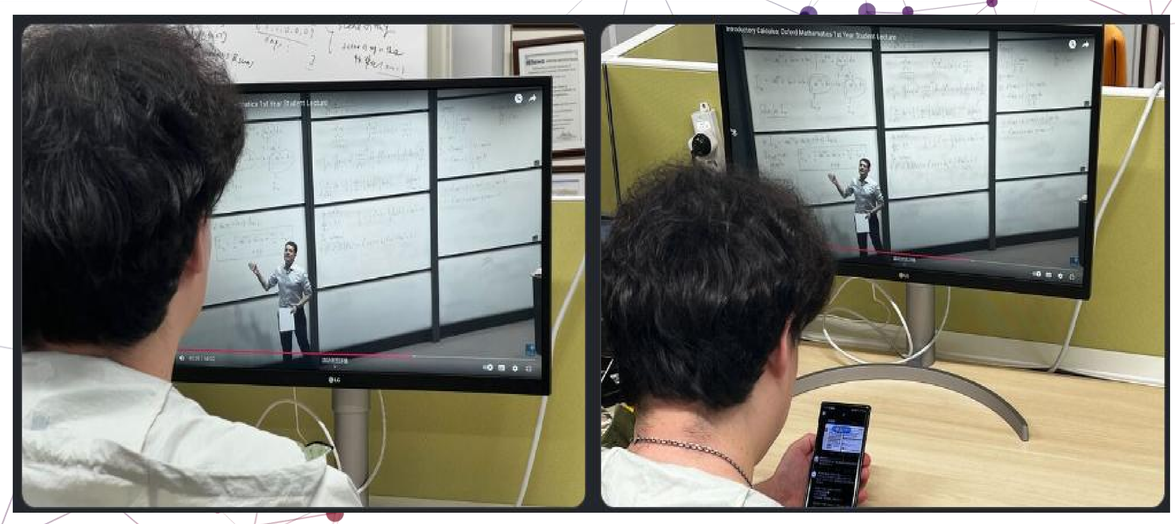
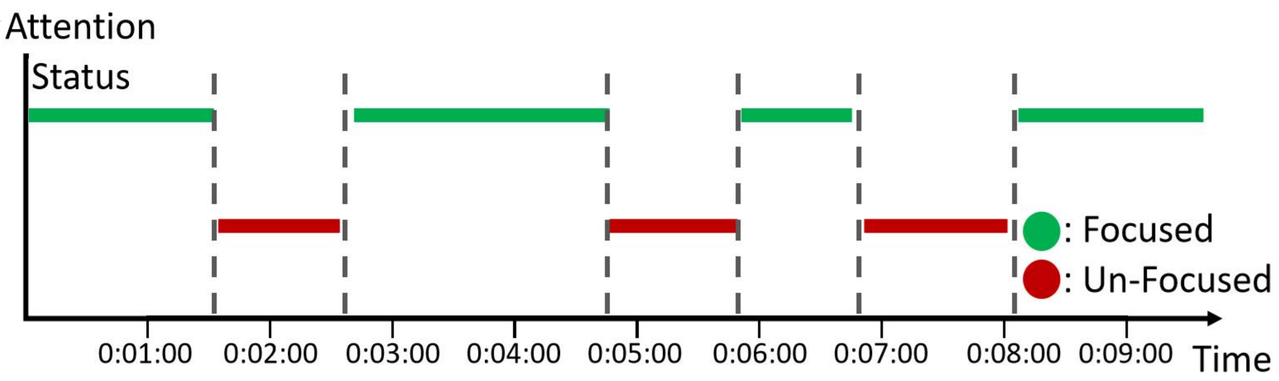
Introduction





A review support system which could **analyse users' attention** and provide **visual review charts** on their video-based learning

Proposed System

User's image captured by the front camera of the personal computer when they are watching the learning video

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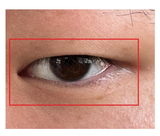
Pupil detection with a **fine-tuned** Yolov5 model



Manually labeled **992** eye-images, 248 each of "two eyes open,""two eyes closed", "one eye open" and "one eye closed"

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Number and condition of detected eyes

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Determine the user's attentional state

No eyes detected	un-focused
Two eyes closed	un-focused
Two eyes open	focused

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Match with the **timeline** of the learning video

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Visualization of the user's attentional state

Experiment

- Participants information

Experimental Gruop: 10 college students

⟶ review via the visual chart of the attention-status

Control Gruop: 10 college students

⟶ review via pensonal memory

- Experiment's procedure
  - Ask participants to do video-based learning
  - Purposely distract participants' attention via designed message
  - Ask for watching short videos
  - Require message response
- Give both of two groups 3 minutes to review
- Test the content of the learning video

- The learning video and test problems used in experiment

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A.松鼠 B.鼠 C.海豚 D.水獭 E.企鹅 F.大猩猩

Result

Analyse the correct rate of each participant, and the result is as follows

FCR: The rate of correct answers in focused parts
UCR: The rate of correct answers in un-focused parts
TCR: The rate of correct answers in total

	FCR	UCR	TCR
Experimental Group	90.2%	93.7%**	92.8%*
Control Group	92.3%	67.0%	81.9%
Difference Value	-2.1%	**26.7%**	**10.9%**

(**p<0.01 , *p<0.05)

Discussion & Conclusion

For FCR: Ext.≈ Ctrl. > 90%, both groups of participants were good at learning and had similar capability

For UCR: Ext. > Ctrl. 26.7%(93.7%-67.0%), proposed system was effective in finding the parts that participants should review due to the lack of attention

For TCR: Ext. > Ctrl. 10.9%(92.8%-81.9%), participants who used the proposed system achieved higher scores on the test

The proposed system helped participants to **review more effectively** in a limited time to **reduce the negative effects** of lack of attention

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