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Prototype of Lifting Posture Monitoring System for Preventing Low Back Pain

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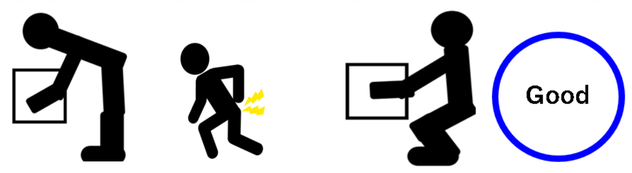
INTRODUCTION & AIM

Lifting Postures [1]

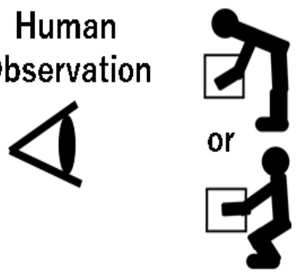
(A) Stooping (B) Squatting



Squatting is suitable for preventing lower back pain in lifting[1].

Observation in Occupational Health

Human Observation



Limitations
- ➡frequency
- ➡not anyplace
- ➡repeatability
- ➡fatigue in observer
- ...

Monitoring systems are required.

Our previous study [2] proposed the automatic **posture recognition method** by using 2D images and machine learning.

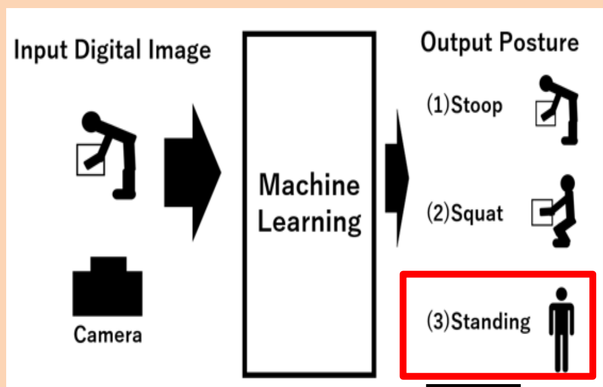
The aim was to develop a prototype lifting posture monitoring system using common camera.

DEVELOPMENT

Proposed System

Proposed system recognize three postures.

- ・Squatting
- ・Stooping
- ・Standing (not lifting)



Standing posture is detected for removing unrelated images.

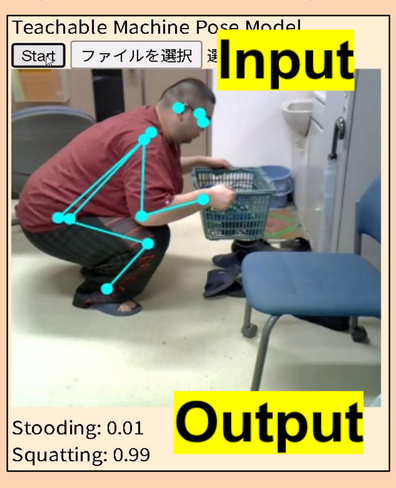
Prototype System

❶Implementation
➡HTML and JavaScript

❷Machine Learning
➡MobileNetV2 [3]
➡Teachable Machine [4]

❸Input
➡Images or movie from camera of laptop PC

❹Output
➡Probability of each posture (results of recognition)



Conditions of Machine Learning

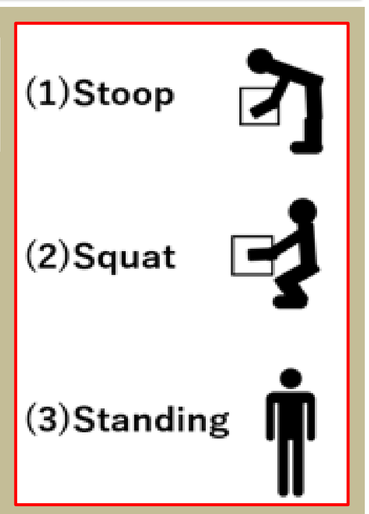
Epoch	200
Batch Size	16
Learning Rate	0.0001

EVALUATION

We evaluated whether machine learning could recognize three postures.

Posture Images
➡150 images
(50 images for each posture)

Training and Testing
➡5-folds Cross Validation



RESULTS & DISCUSSION

Table1 Confusion Matrix : Correct Recognition

		Actual		
		Squatting	Stooping	Standing
Recognized	Squatting	37	7	0
	Stooping	13	43	0
	Standing	0	0	50

Accuracy of Recognition: 0.867

- ・Accuracy was **comparable** to **human observations** [5].
- ・**Machine learning** of the prototype system **can extract and recognize** lifting postures.

CONCLUSION

- This study **developed** a **prototype lifting posture monitoring system** using common camera.
- The results indicate that the **prototype system can extract and lifting postures** to prevent low back pain.

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Conflict of Interest : The authors declare no conflict of interest.

References

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