高速プロジェクタの衝撃

東京大学　渡辺義浩

INTRODUCTION

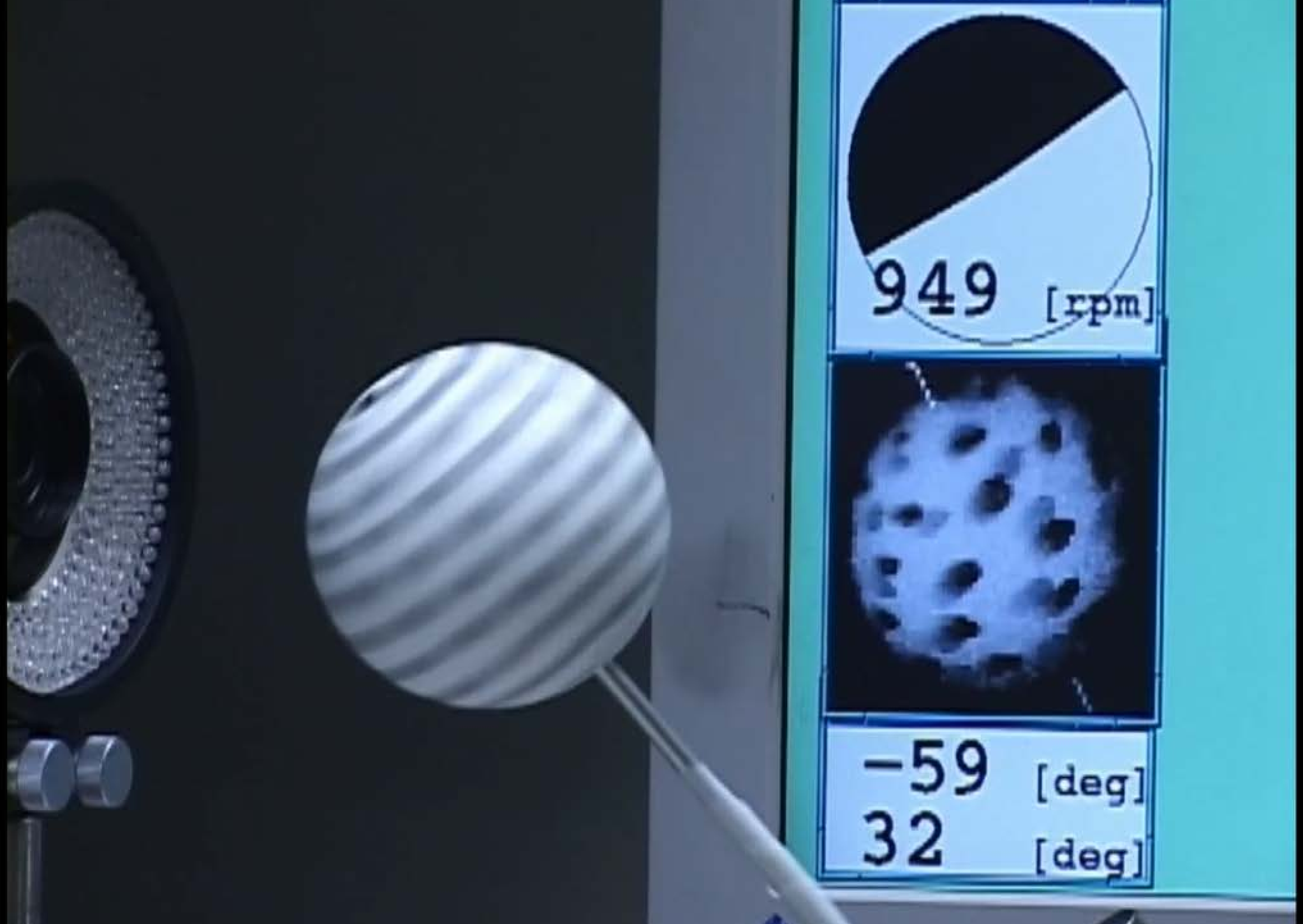
なぜプロジェクタを高速化するのか

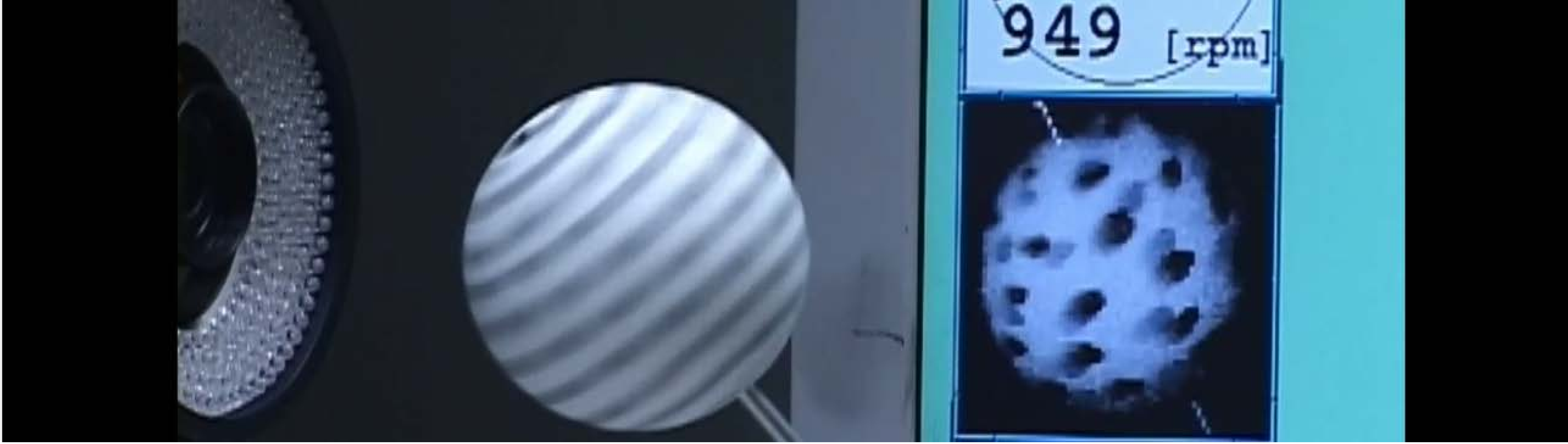
OUR MISSION

SENSING × REACTION

SPEED

秒間1,000回


949 [rpm]
−59 [deg]
32 [deg]



高速に実世界を把握する

SENSING

Color, 3D shape,

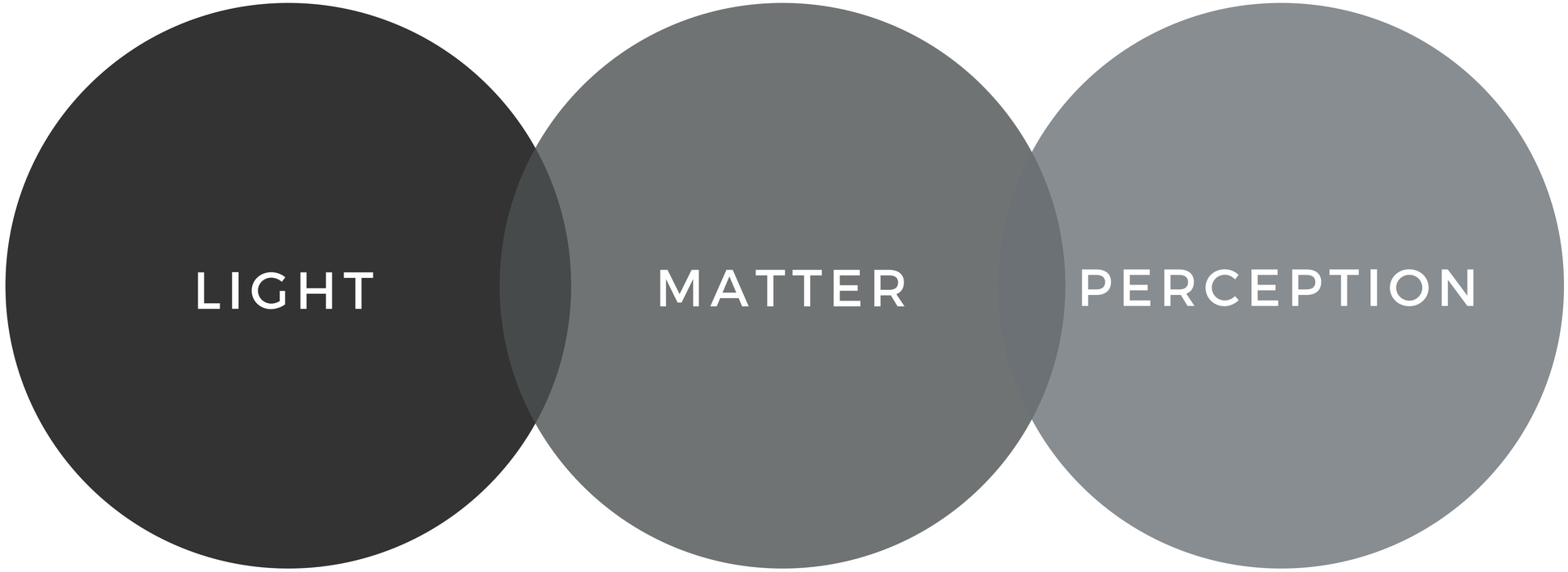
3D motion, Reflectance, etc

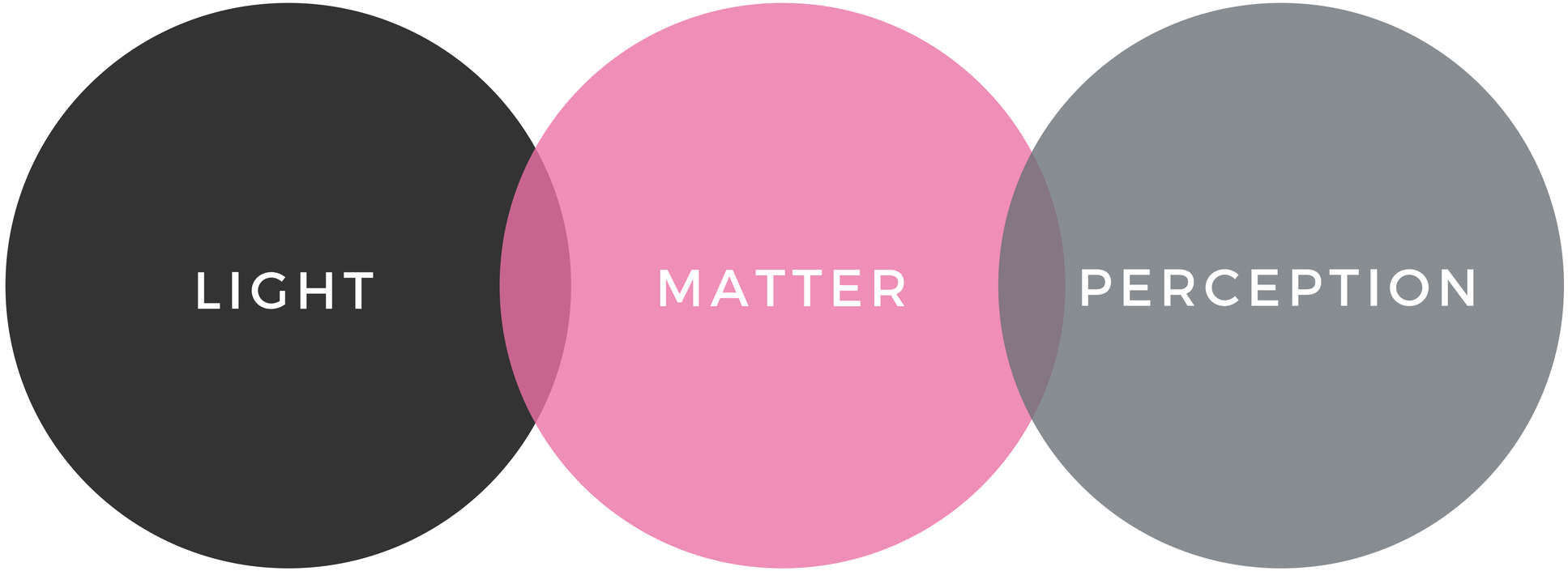
高速に実世界を制御する

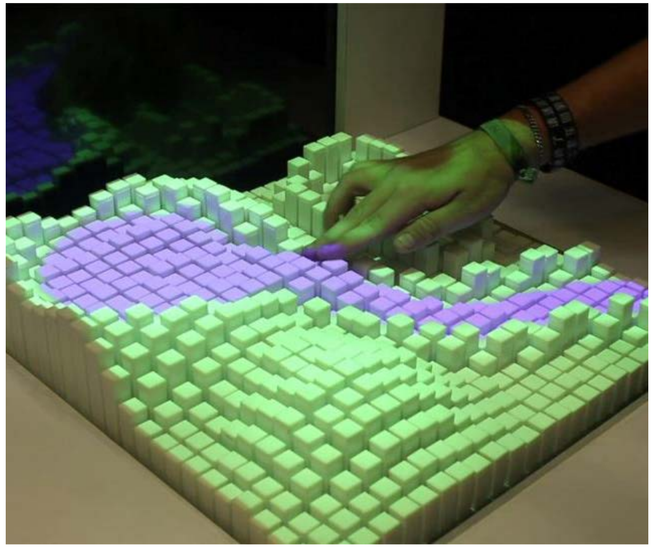
REACTION

Projector

プロジェクタに求められるもの


LIGHT
MATTER
PERCEPTION


LIGHT
MATTER
PERCEPTION

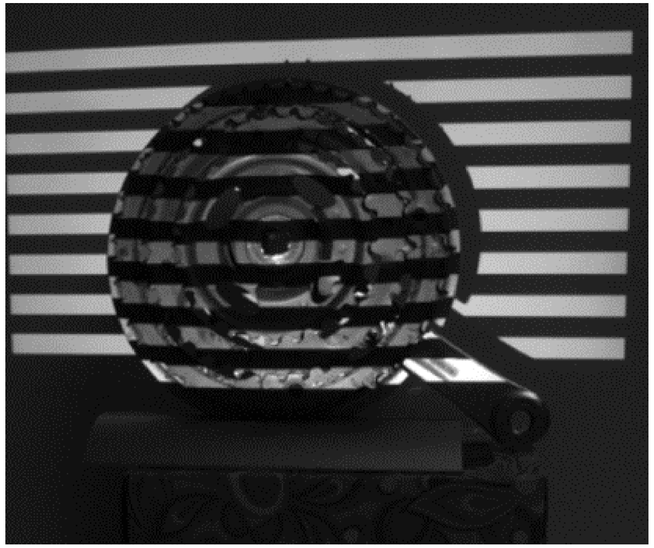


USER INTERFACE

Materiable (2016)

PROJECTION MAPPING

TOKYO STATION VISION (2012)



COMPUTER VISION

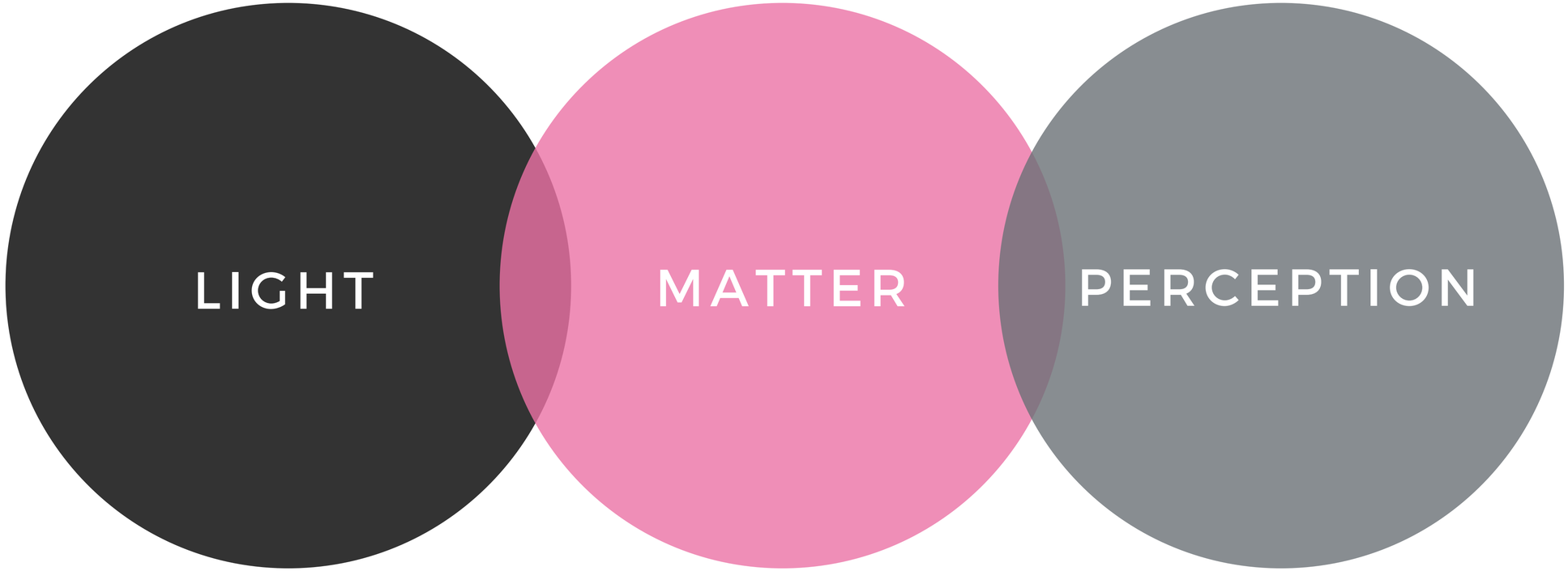
3D Scanner by Texus Instruments

プロジェクタに求められるもの

light　perception　matter

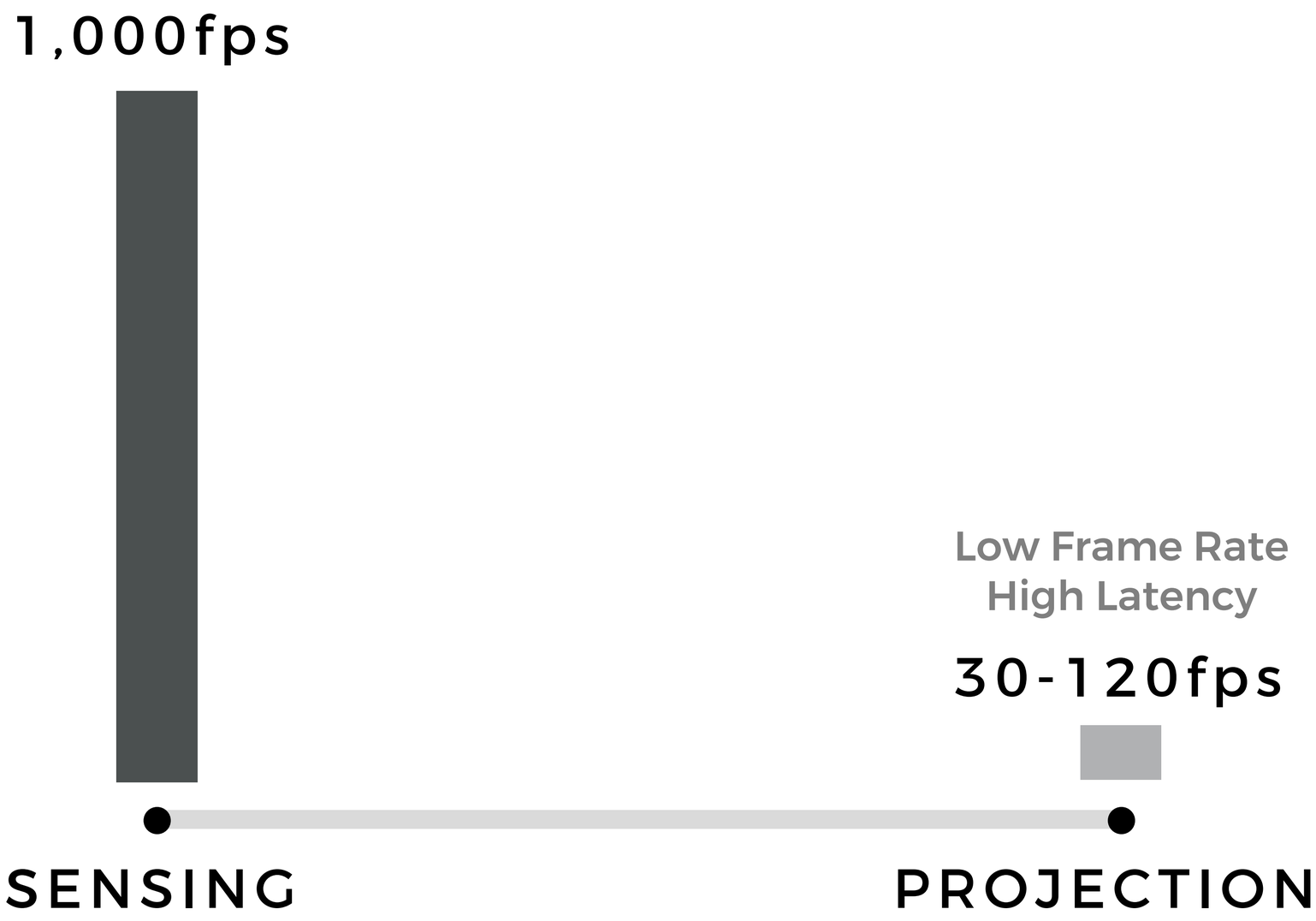
光で知覚上の現実を変質させる

自然・アンビエント・調和


LIGHT
MATTER
PERCEPTION

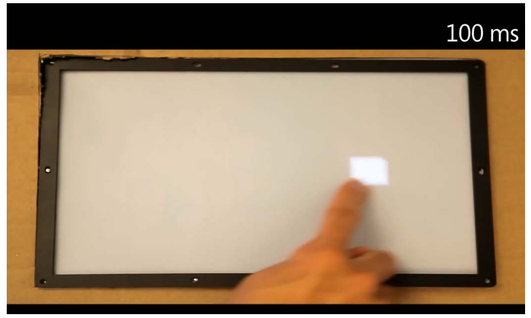
HIGH-SPEED PROJECTION & SENSING

OUR MISSION

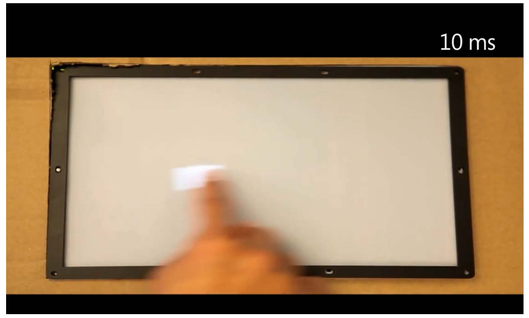

1,000fps
Low Frame Rate
High Latency
30-120fps
SENSING
PROJECTION

Human can perceive

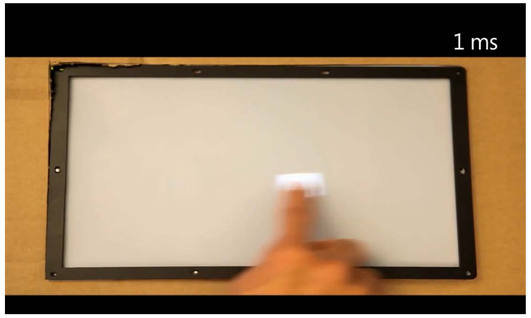
6.04ms projection delay [Ng, *et al*. 2012]



100ms delay



10ms delay



1ms delay

8-bit image projector at 1,000fps with 3ms delay

高速プロジェクタ DynaFlash

Ishikawa Watanabe Lab
The University of Tokyo
DynaFlash
High-speed 8-bit image projector at 1,000fps with 3ms delay

036
30fps
036
30fps
036
30fps
036
30fps
036
30fps
033
1000fps
034
1000fps
035
1000fps
036
1000fps
037
1000fps

digital texture

ダイナミック
プロジェクションマッピング

Ishikawa Watanabe Lab
The University of Tokyo

Toward new projector applications

high-speed projector + high-speed vision

Ishikawa Watanabe Lab
The University of Tokyo

perceptual reality

リアリスティック
ディスプレイ

COMPUTER GRAPHICS

STOP MOTION

裸眼

両眼融合

運動視差

光線再現

提示したい実物体をそのまま利用しては？

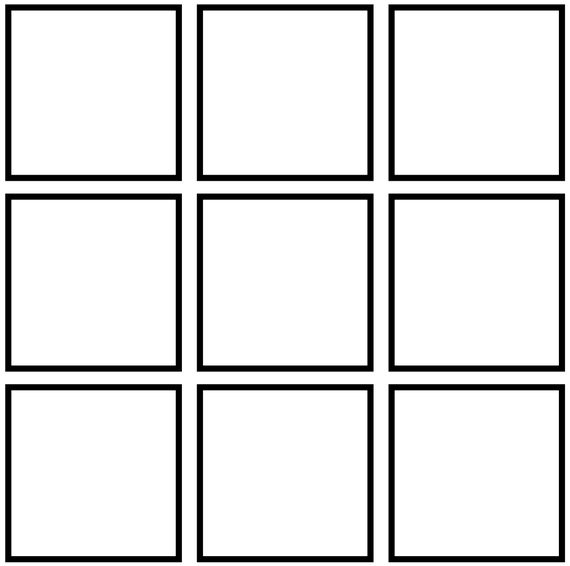
light perception matter

光で知覚上の現実を変質させる

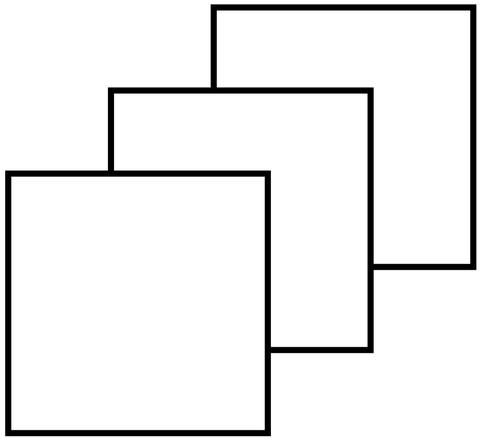
COMPUTATIONAL ILLUMINATION

臨界融合周波数

PERSISTENCE OF VISION



空間融合



時間融合

Ishikawa Watanabe Lab
The University of Tokyo

Phyxel

A Realistic Display using Physical Objects with High-speed Spatially Pixelated Lighting

Ishikawa Watanabe Lab
The University of Tokyo

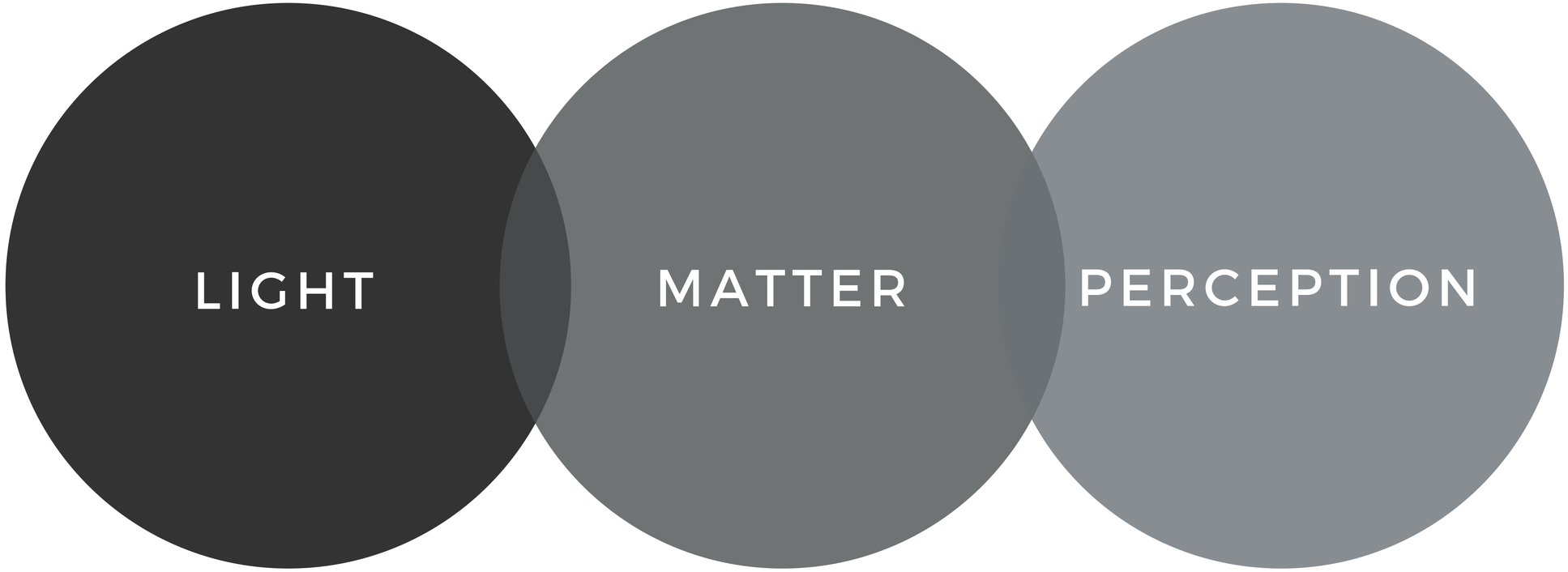
ZoeMatrope

A System for Physical Material Design

Leo Miyashita Kota Ishihara Yoshihiro Watanabe Masatoshi Ishikawa

CONCLUSION

さいごに


LIGHT
MATTER
PERCEPTION

PROJECTOR & SPEED

KEY POINT 1

PROJECTOR & SOCIETY

KEY POINT 2

PROJECTOR & REALITY

KEY POINT 3

VISION
ARCHITECTURE

Researches are done by

Doctor Course: L. Miyashita

Master Course: G. Narita, T. Yoshida, S. Tatsuno

WEB

http://www.k2.t.u-tokyo.ac.jp/

YouTube

https://www.youtube.com/user/IshikawaLab

プロジェクション ディスプレイ技術研究会

高速プロジェクタの衝撃

Strong Impact by High-speed Projector