Visual IoT for Disaster Mitigation in ASIA

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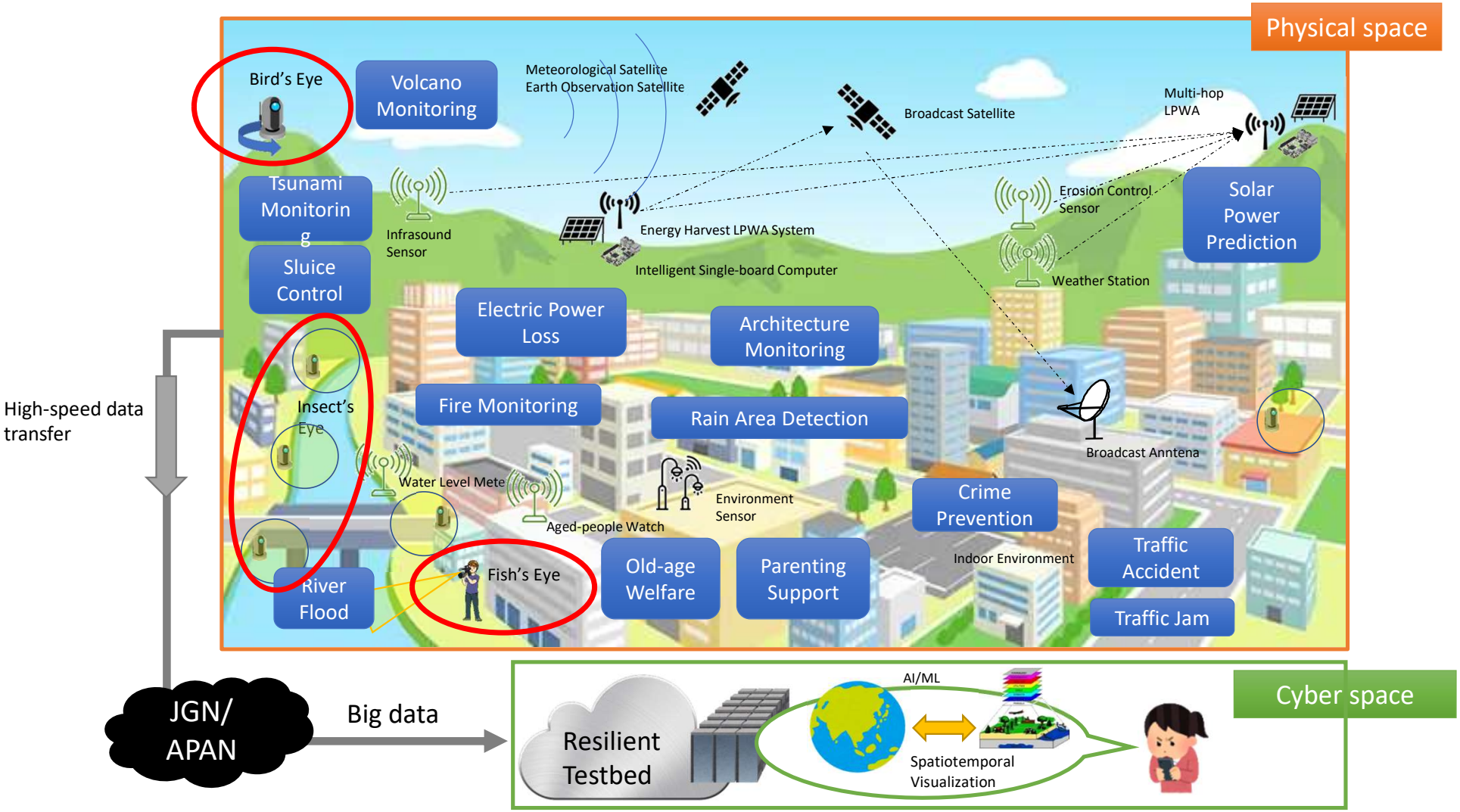
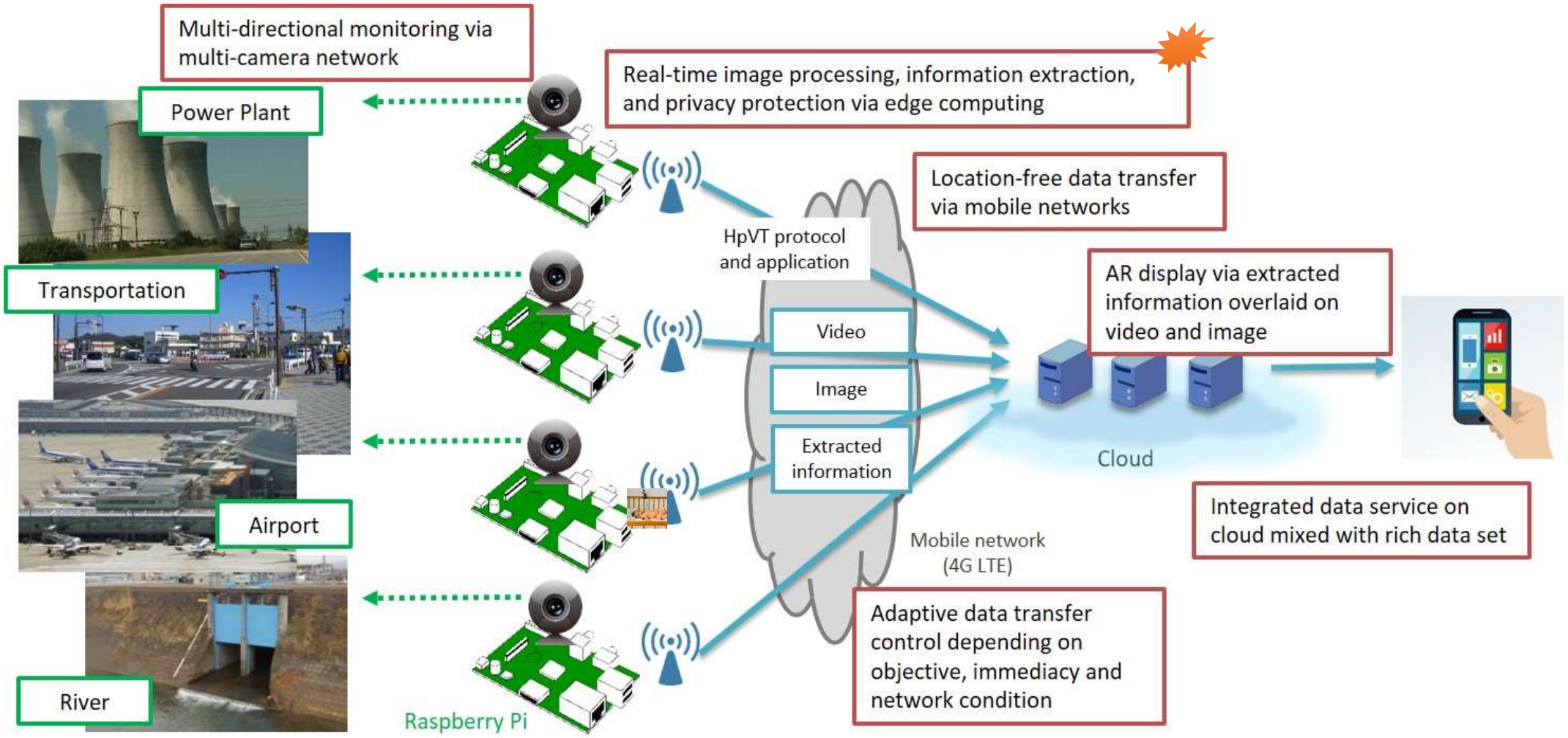
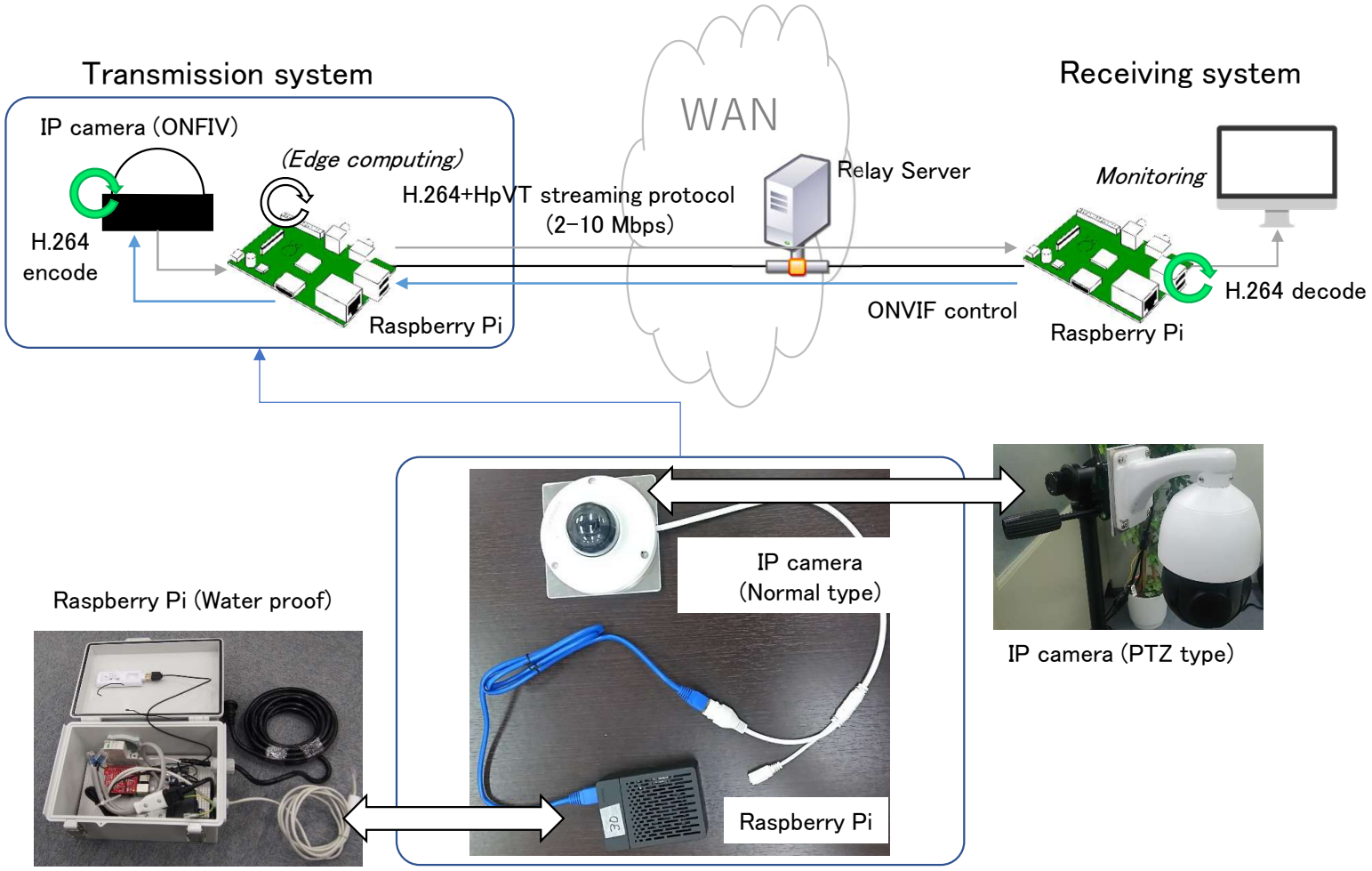
Resilient Natural Disaster Mitigation Concept: Cyber-Physical



Concept of “Visual IoT”

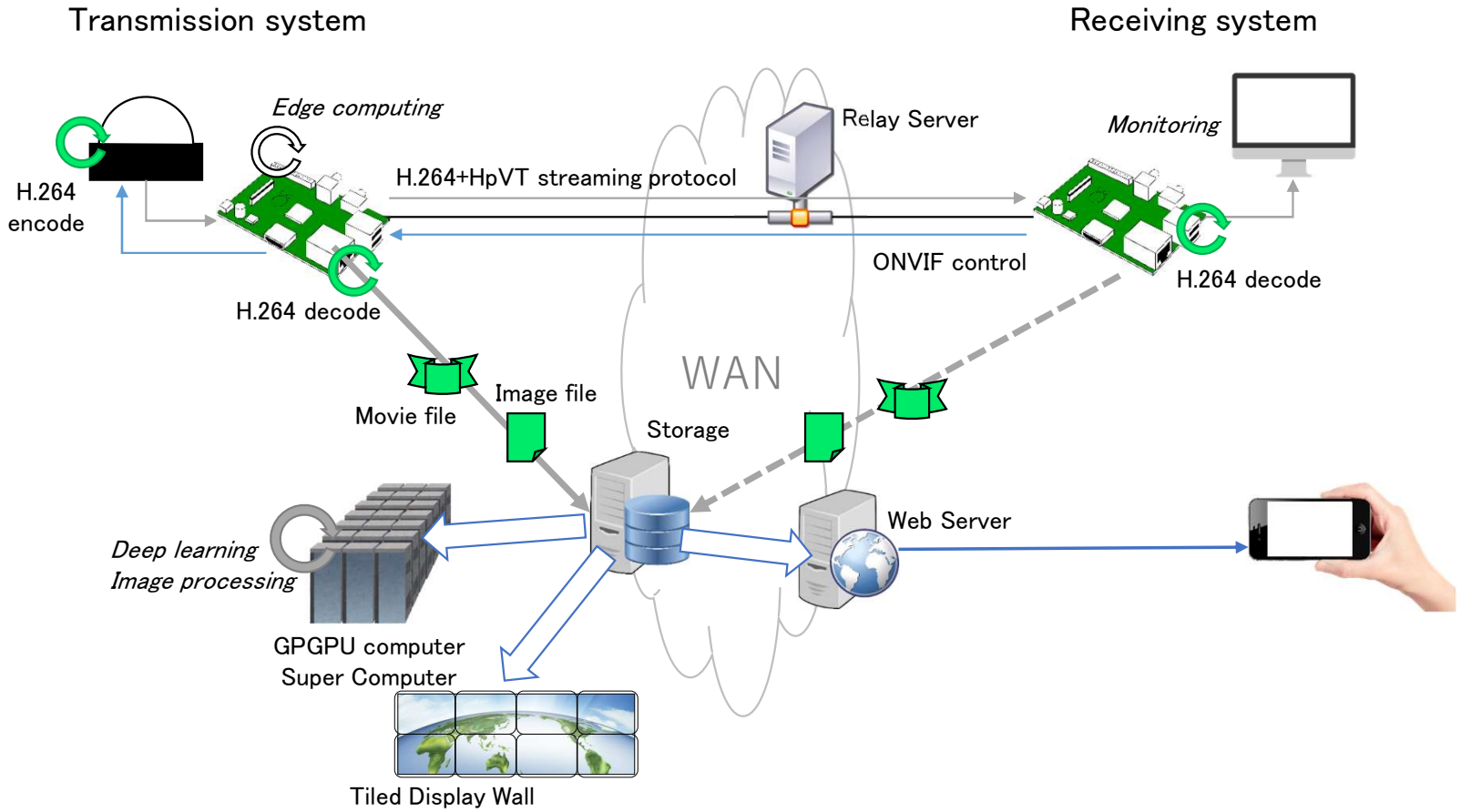


Visual IoT System Configuration



Visual IoT Implementation

expansion to AI and large-scale visualization

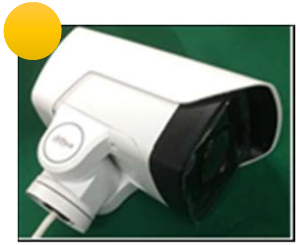


Commercial IP camera

ONVIF (profile S) required

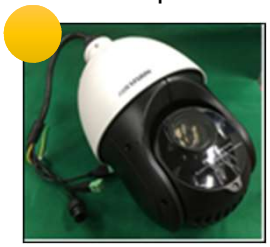
300 – 1,500 USD

Desk-top type



Barrett type

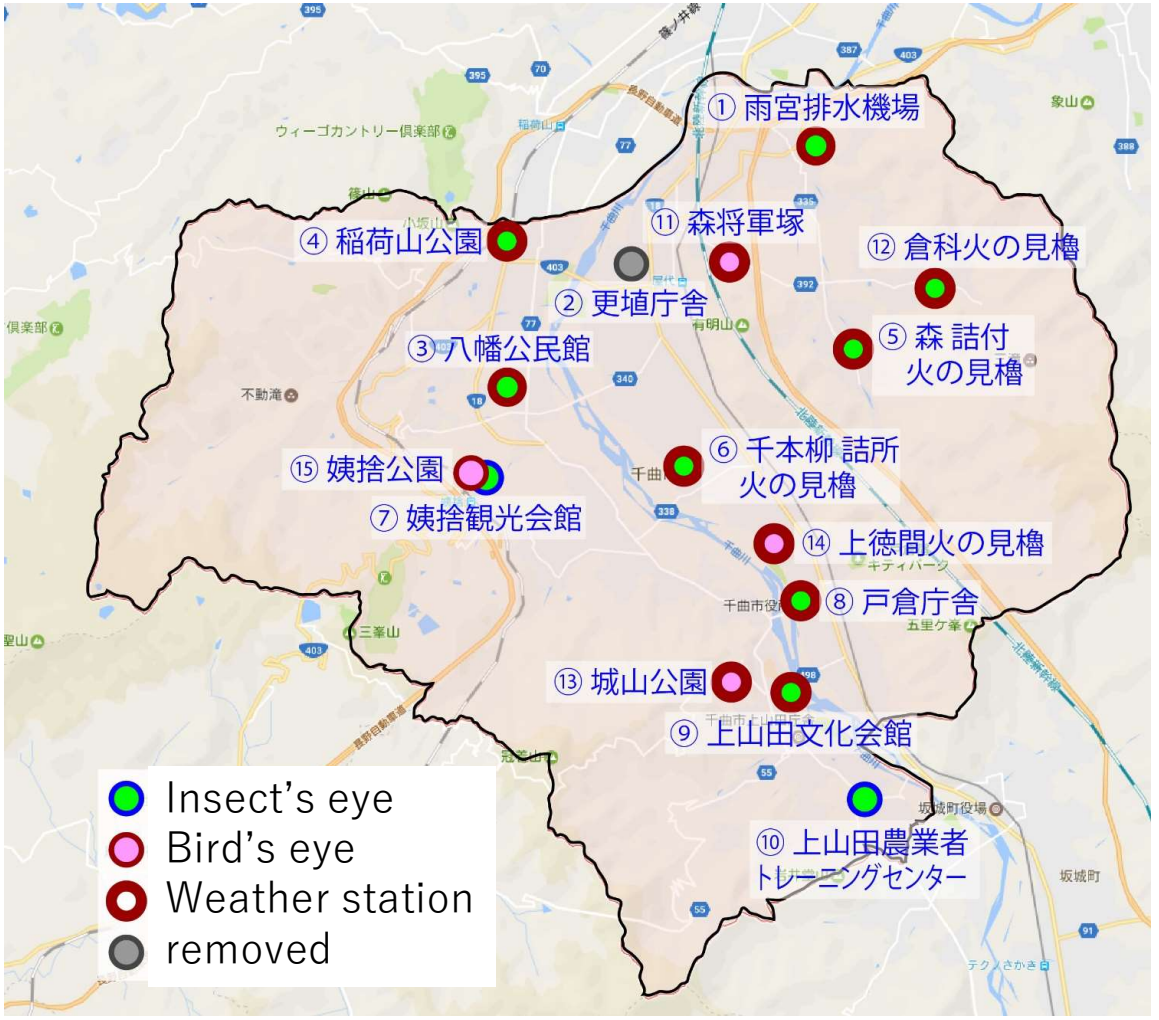
Japanese lantern type



Dome type

PTZ (Pan-Tilt-Zoom)

Chikuma ANZU project



Chikuma ANZU project: Visual IoT system

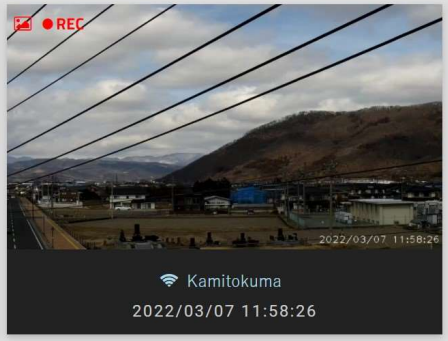
2022/03/07 11:59:08

5columns

Amenomiya
2022/03/07 11:58:19

Inariyama
2022/03/07 11:57:24

JoyamaPark
2022/03/07 11:58:57



Kamitokuma
2022/03/07 11:58:26

KamiyamadaCC
2021/10/01 00:03:59

KamiyamadaTC
2022/03/07 11:57:54

Kurashina
2022/03/07 11:57:52

Mori
2022/03/07 11:58:19

MoriShogunzuka
2022/03/07 11:58:52

Obasute
2022/03/07 11:52:27

ObasutePark
2022/03/07 11:58:55

Senbonyanagi
2022/03/07 11:57:29

Togura
2022/03/07 11:49:02

Yawata
2022/03/07 11:57:47

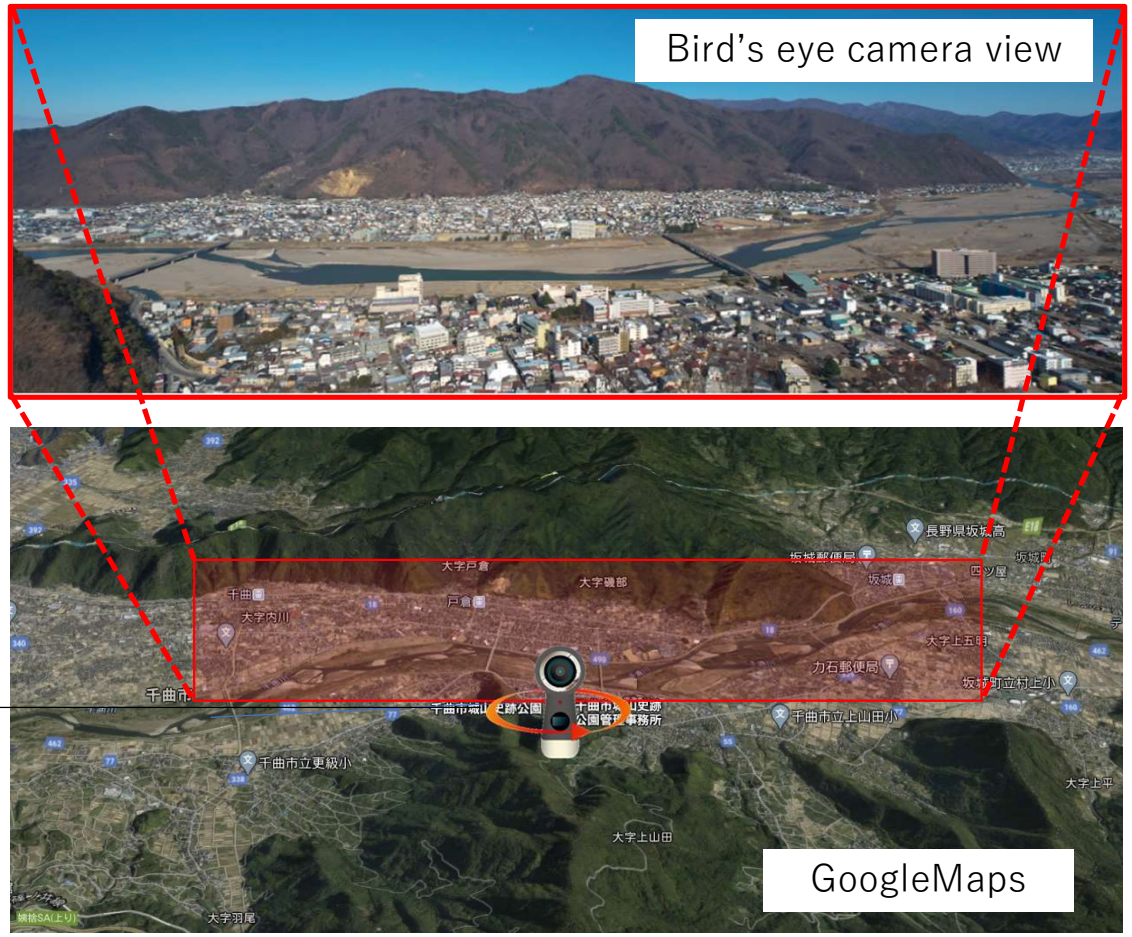
Insect’s Eye: Snowfall Detection (Daytime/Nighttime)

Amenomiya, Chikuma, Nagano (Japan)

Bird’s eye camera: An application of Visual IoT technique

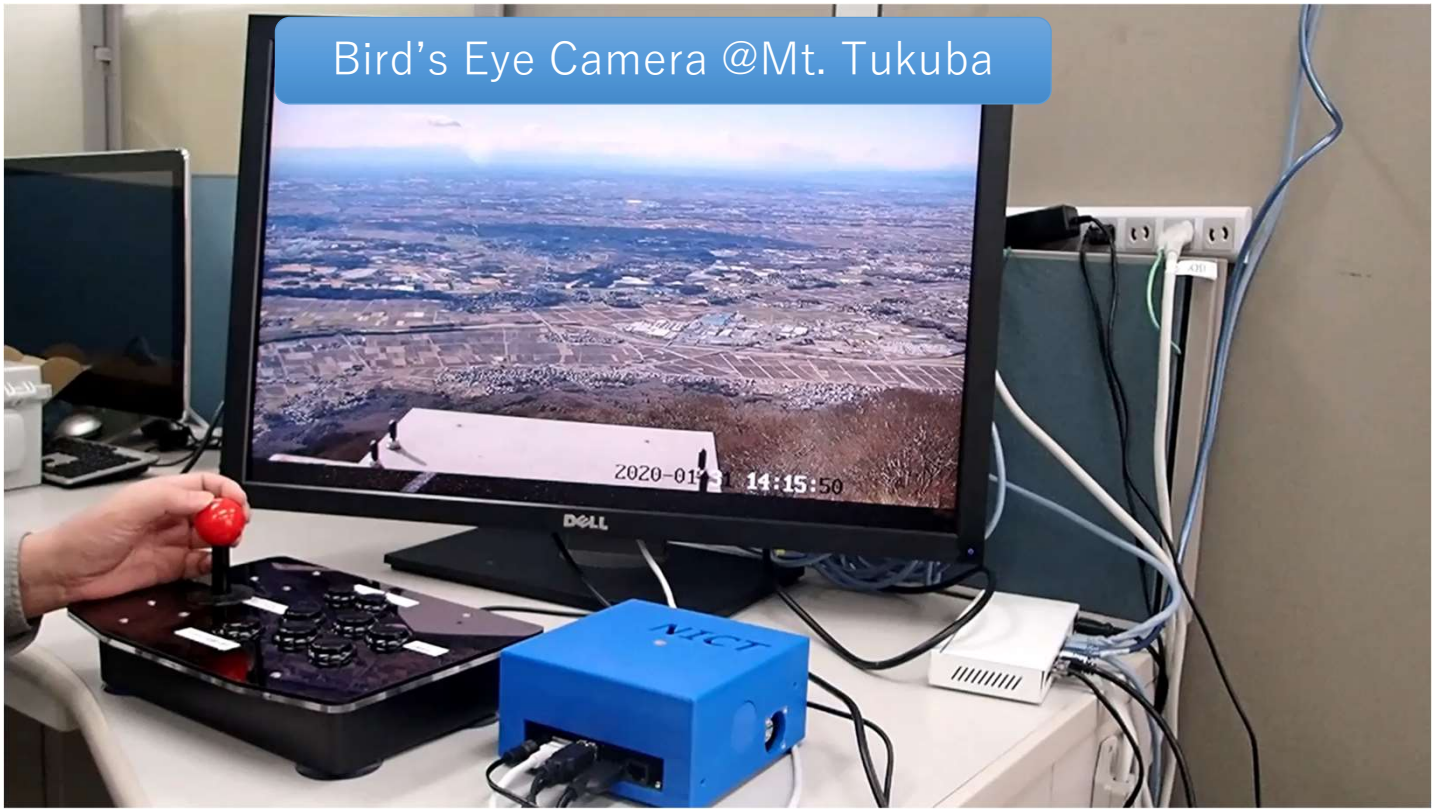
Pan-Tile-Zoom function

Chukuma city, Nagano, Japan

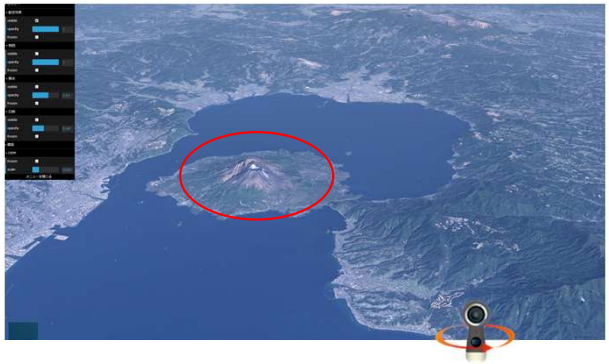


Highly precise PTZ (Pan-Tilt-Zoom) operation

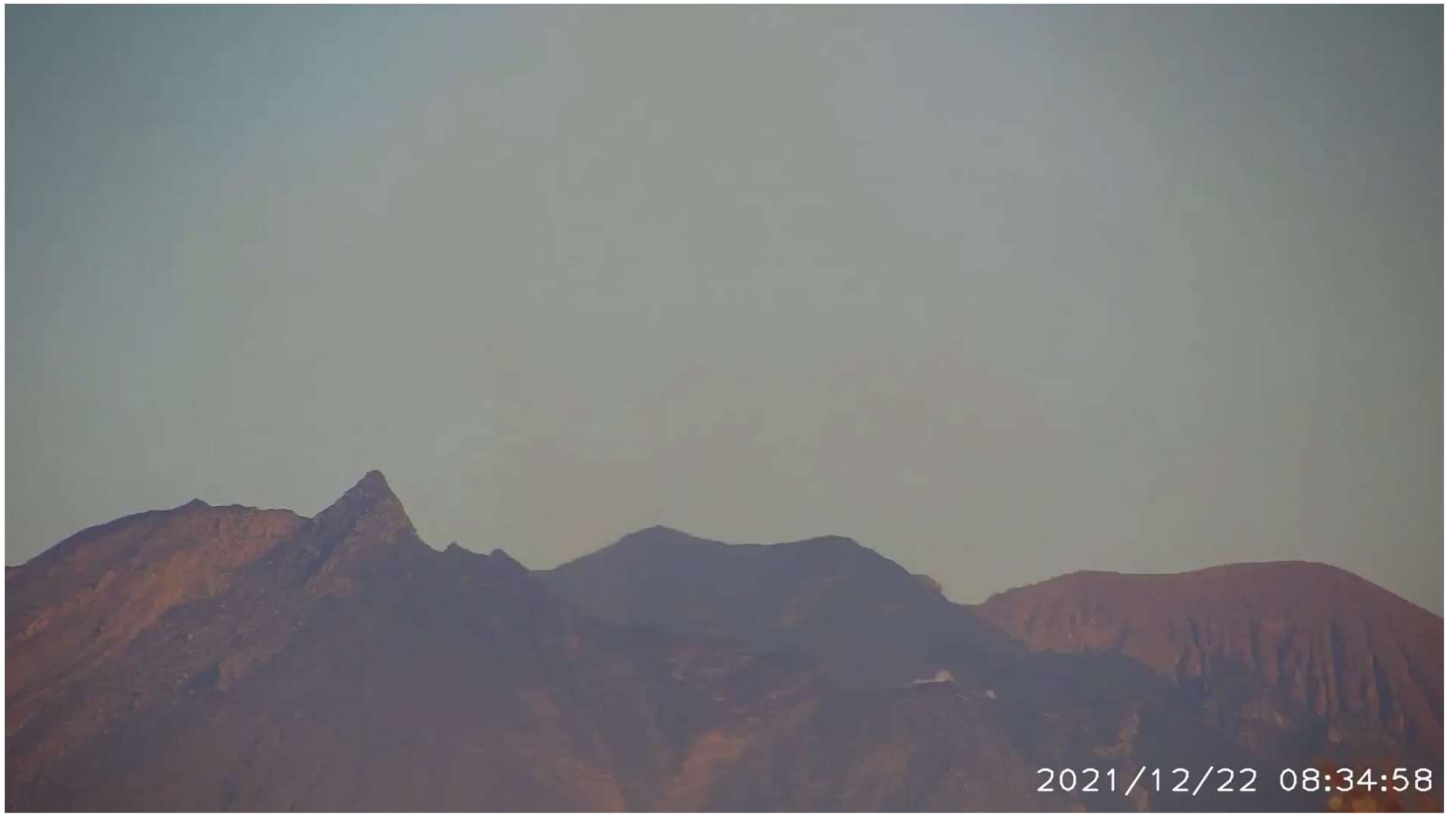
https://www.youtube.com/watch?v=cNCGVany0BQ&feature=youtu.be



Highly precise PTZ (Pan-Tilt-Zoom) operation



Volcano Monitoring (remote)
Sakurajima@Kagoshima Volcano Monitoring

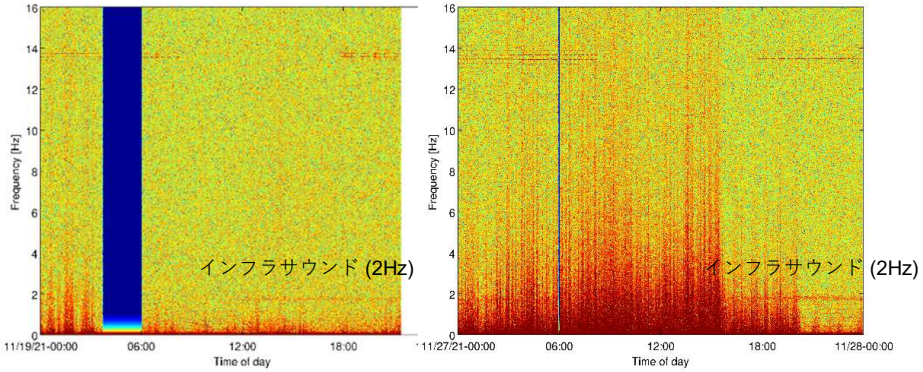


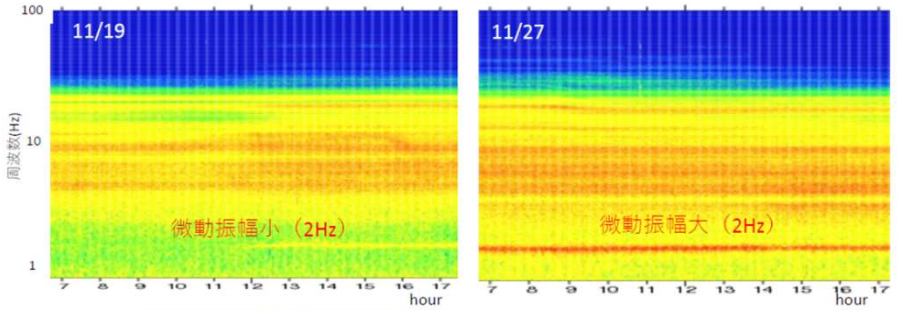
Date/Time	JMA (official)	Visual IoT
2021-12-20 12:56	×	○
2021-12-21 08:05	○	○
2021-12-22 08:38	○	○
2021-12-22 13:17	×	○
2021-12-22 17:37	×	○
2021-12-24 17-29	×	○
2021-12-28 23-24	○	×
2022-01-01 21-05	○	×
2022-01-02 11:39	×	○
2022-01-04 12:17	×	○
2022-01-05 08:48	×	○
2022-01-07 01:43	○	×
2022-01-18 03:24	○	×
2022-01-18 23:24	○	×

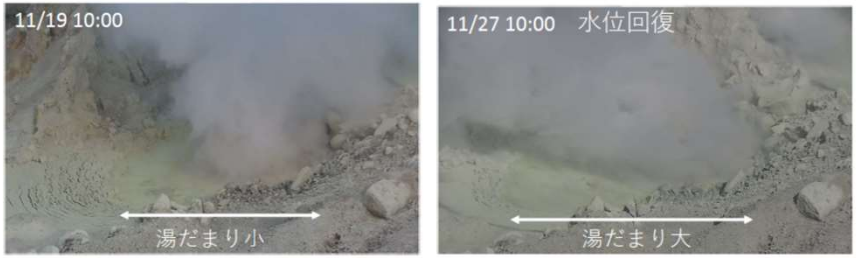
Daytime

Nighttime

Volcano Monitoring (in situ): Ebino@Miyazaki, Japan







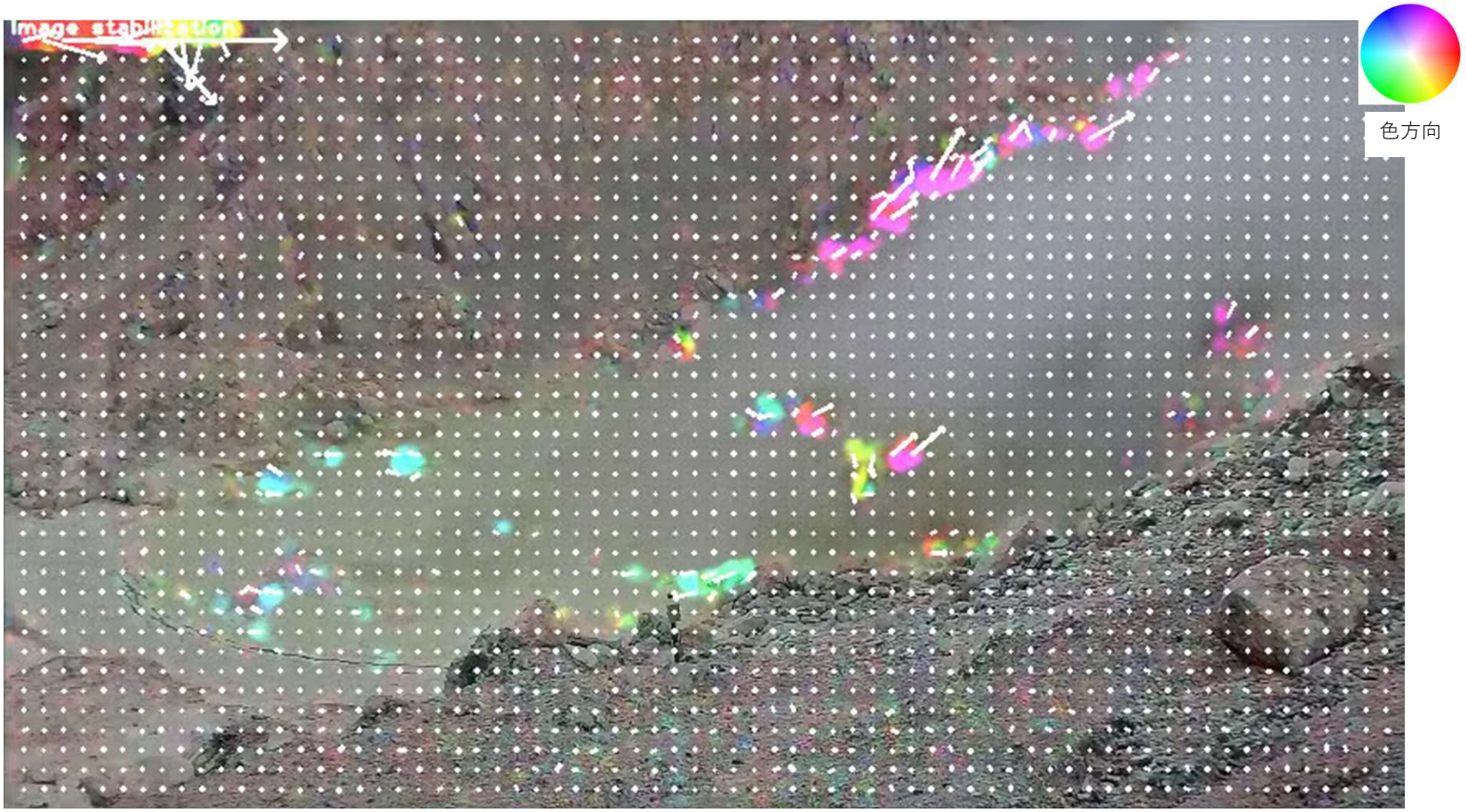
宮崎県えびの高原

Volcano Monitoring (in situ)

Realtime Movie

Volcano Monitoring (in situ)

Optical Flow Analysis and Visualization



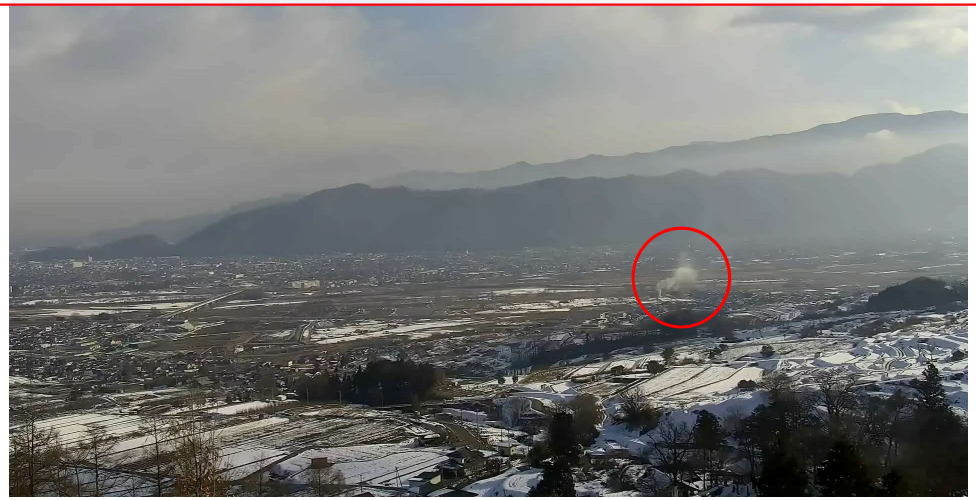
Harmful Animal Monitoring: tapetum detection

Smoke Detection via Visual IoT

Kazutaka Kikuta
Ken T. Murata
（NICT）

Smoke events detected by our Visual IoT systems

Smoke areas are in general not large in many cases….



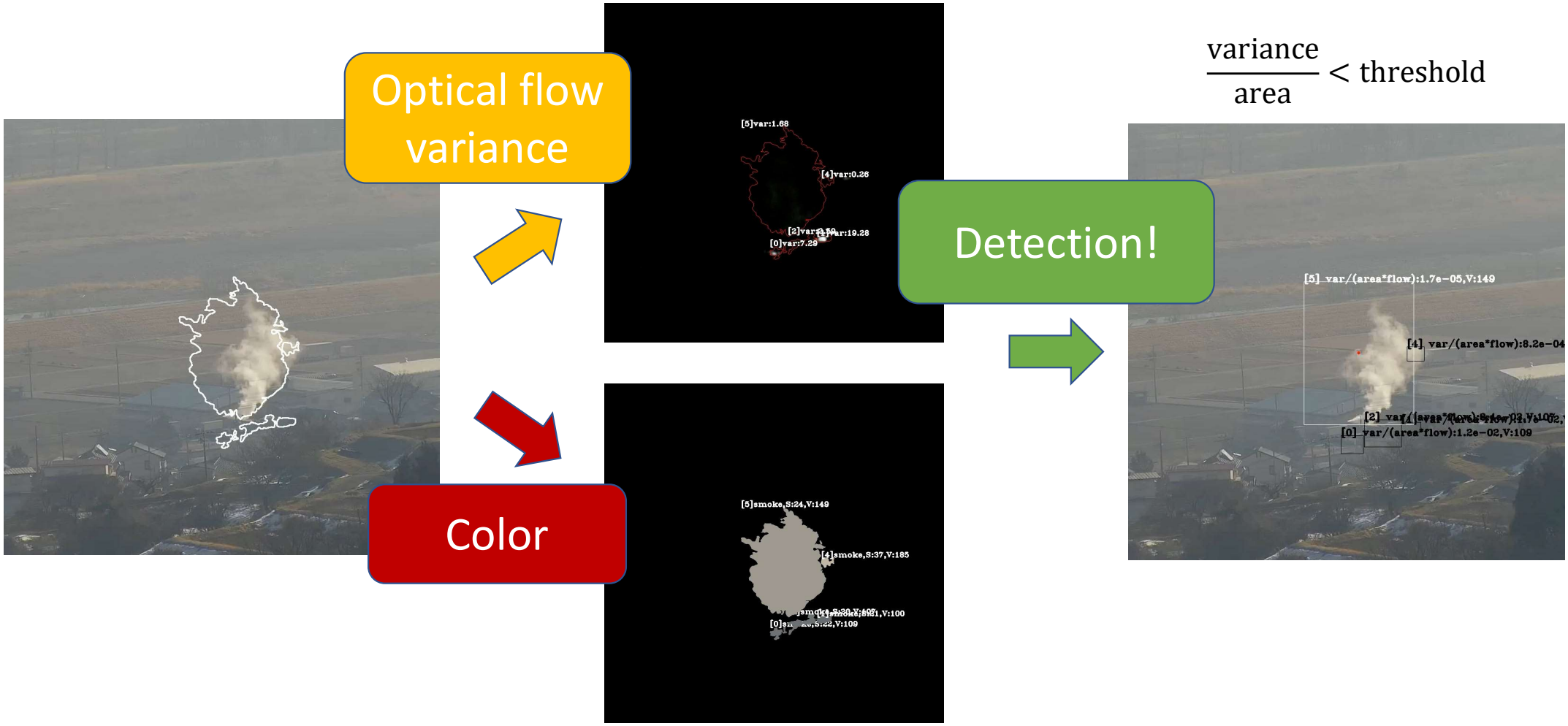
Smoke-prone area detection via optical flow (1/2)

- Optical flow with 125 frames

Optical flow

Edge Detection

Smoke-prone area detection via optical flow (2/2)

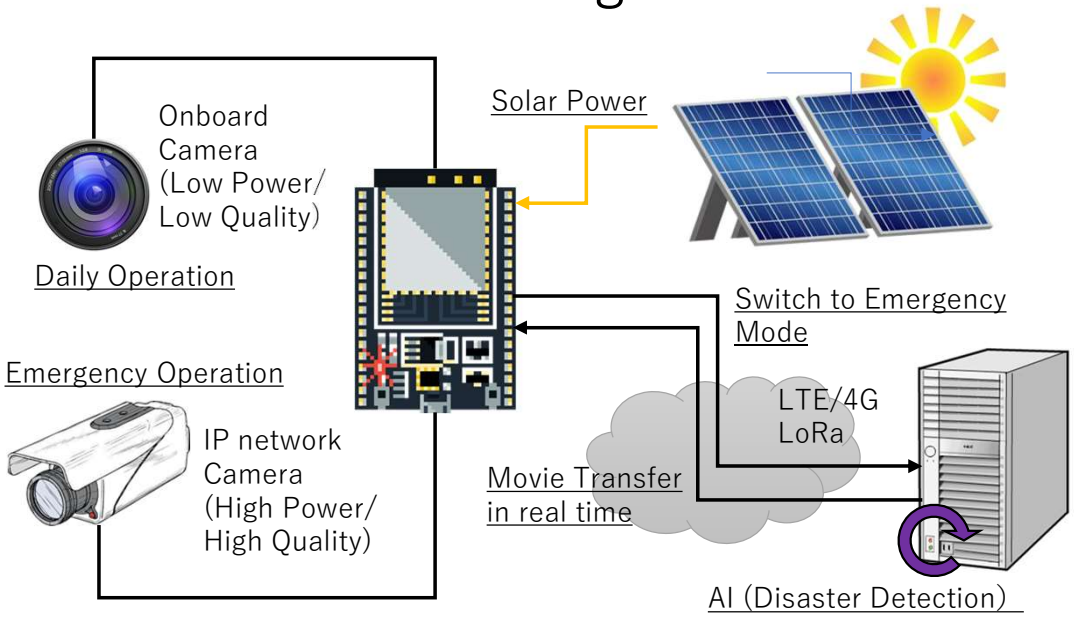


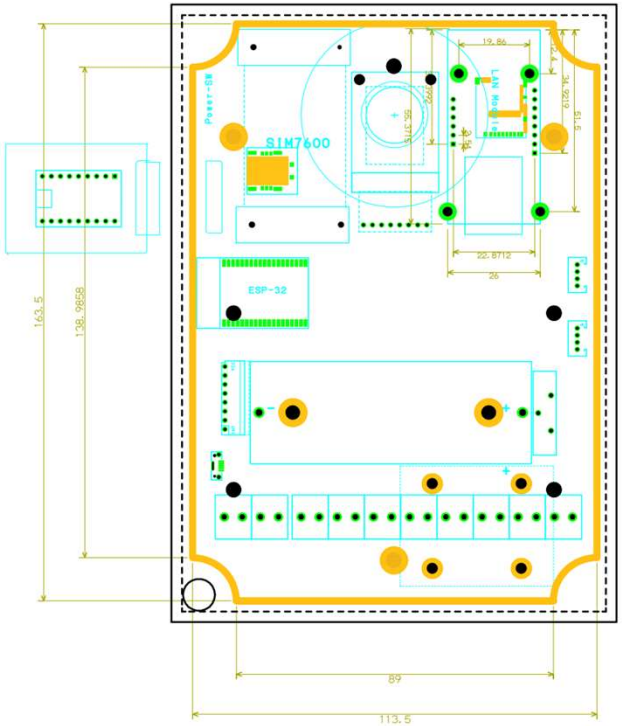
STEP1: detection of smoke-prone area in Chikuma city in Japan

STEP2: autonomous zoom-in to smoke area


Detection
[8] var:2.173,mag:1.29,area:498,V:228
[7] var:2.662,mag:1.18,area:726,V:227
[6] var:0.105,mag:0.69,area:730,V:143
[5] var:0.048,mag:0.87,area
[4] var:
[3] var:0.482,mag:1.47,area:543,V:112
[1] var:1.133,mag:1.19,area:556,V:100
[0] var:2.004,mag:2.53,area:4086,V:104

Energy-harvest visual IoT system using 4G/LTE and Long-distance LoRa communications





- Installation of energy-harvest visual IoT system in Asian country (countries)
- Operation of video transfer with solar power, but without PTZ functions
- Real-time movie transfer to NICT B5G testbed to detect disaster
- Detected information is quickly returned to the country

- Proto-type will be released in Aug 2022.
- Two sample device with global SIM module for Asian countries
- Make contact with me if you like…

Stitching and TDW

大規模化・高速化

フルHD（1920×1080）11枚画像の
スティッチング（10200×1200）事例

フルHD（1920×1080）208枚画像の
スティッチング（15000×4200）事例

CPU:Intel Core i9-9900K@3.60GHz, memory:128G, GPU:GeForce RTX 2080 Ti
2243 sec → 156 sec (約14倍の高速化)

AI型画像処理による都市域煙探知と超高解像度TDW（タイルドディスプレイ）上での可視化

- 煙発生の自動検出
  - PTZ操作を組み合わせることで自律ロボット化（インテリジェント化）

- TDW上での可視化
  - リアルタイムタイル画像化の実施（想定解像度：60000×8000（60K8K））