News release

May 30, 2018

1-13-5, Kudan kita, Chiyoda-ku, Tokyo
MITSUBISHI ELECTRIC ENGINEERING Co., Ltd.

AI, image analysis technology, and high-sensitivity sensor deliver water level measurement regardless of day, night, or weather conditions

Started accepting orders for “Field Edge®” - the latest image-based water gauge

MITSUBISHI ELECTRIC ENGINEERING Co., Ltd. (Head office: Chiyoda-ku, Tokyo; President: Hideaki Nagatomo) will start accepting orders for “Field Edge®”, the image-based water gauge from July 2. The “Field Edge®” integrates “AI-powered water level measurement” technology using AI (artificial intelligence)*1, image-based water level analysis, and high-sensitivity full HD sensor to deliver the non-contact water level measurement equivalent to visual checks regardless of day or night or under whatever weather conditions.

Our product lineup offers two types of detection sensors. One is a fixed type (zoom only) suitable for capturing images in a specific field of view and the other is a multi-point type (zoom and rotate) capable of capturing images in multiple locations. You can easily build the system by combining detection sensors with a measurement processing unit (one model).

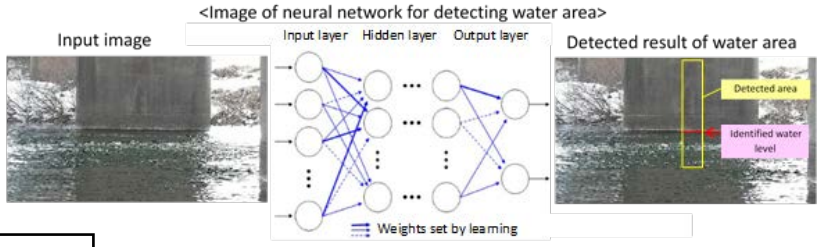
*1: Powered by Mitsubishi Electric's AI technology "Maisart". Maisart

Detection sensor (Fixed type)
(VS-100)

Detection sensor (Multi-point type)
(VS-1300)

Measurement processing unit
(VS-300)

<Image of neural network for detecting water area>



Features of new product

1. **<u>“AI-powered water level measurement” technology delivers non-contact, real-time, and continuous observation</u>**
2. **<u>Water level image analysis algorithm enables highly accurate water level measurement under any weather conditions</u>**
3. **<u>High-sensitivity full HD sensor captures high-definition images regardless of day or night</u>**

Release summary

Product name	Type	Model name	Order accepting date	Price	Target sales
Image-based water gauge “Field Edge”	Detection sensor (Fixed type)	VA-100	July 2	Open	500 sets/year
	Detection sensor (Multi-point type)	VS-1300			
	Measurement processing unit	VS-300			

* Shipment is scheduled around October 2018.

[Media inquiries]
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Aim of release

In recent years, in response to flood damage occurred due to local heavy rain in various places, including river flooding, there are growing needs for real-time and high-accruracy water level monitoring. However, with the existing contact-type water gauge (water pressure type, float type) installed in river channel, there was a problem that floodwaters hindered observation itself.

We will release the image-based water gauge “Field Edge®” that integrates “AI-powered water level measurement”, image-based water level analysis, and high-sensitivity full HD sensor to offer non-contact, real-time, and highly accurate water level measurement. The “Field Edge®” can also contribute to disaster prevention and safety for neighboring residents by creating and publishing masked images to protect their privacy.

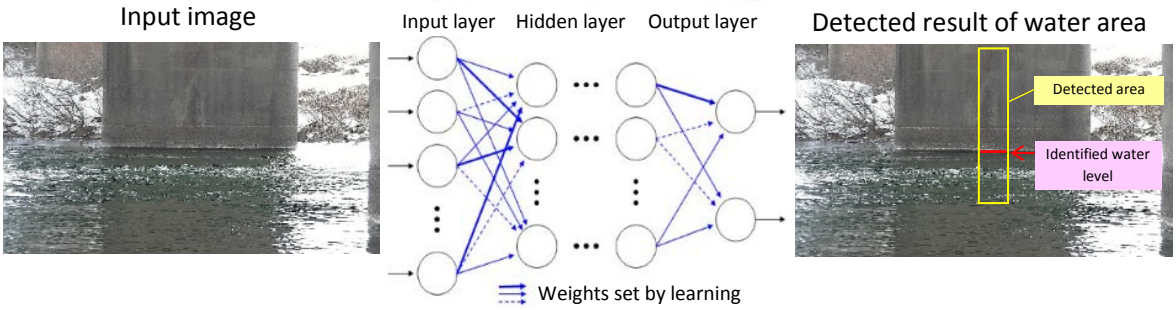
Detailed features of new product

1. “AI-powered water level measurement” technology delivers non-contact, real-time, and continuous observation

(1) Identify water level utilizing deep learning

This newly developed "AI-powered water level measurement” technology detects water area and identifies water level, by utilizing neural networks for detecting water area and having them learn multiple river images of measurement target such as a pier captured beforehand (during day/night, normal/increased water etc.) This technology allows us to achieve a high-accuracy measurement resolution of 2 cm (when the field of view range is 3.6 m), even without water level board.

<Image of neural network for detecting water area>



(2) Non-contact type gauge enables stable water level measurement even when the water level rises

The gauge is non-contact type, so the water level can be continuously and stably observed without losing devices even when the water level rises.

(3) Real-time monitoring of river conditions using water level and images

The WWW server function is installed in the main body of the device, so you can monitor the water level and images of the river in real time on the browser. The multi-point type allows you to remotely control and monitor the field of views by zoom and rotate functionalities.

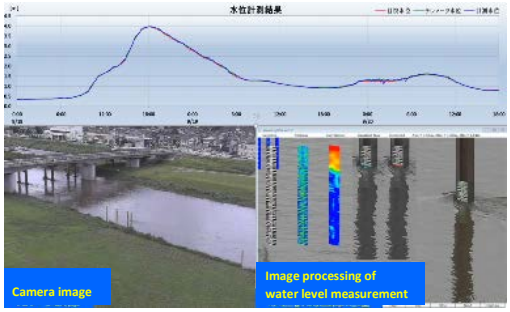
2. Water level image analysis algorithm enables highly accurate water level measurement under any weather conditions

(1) Implemented water level analysis algorithm

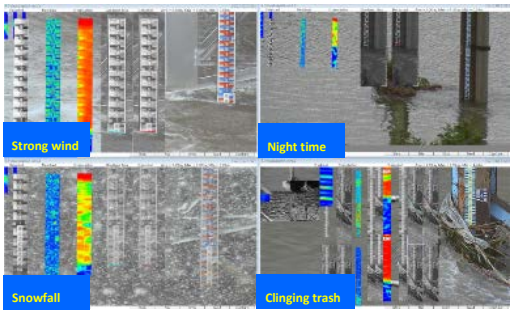
We developed our unique water level analysis algorithm, which provides the highly accurate water level measurement based on an image correlation between a reference image and a real-time image of water level board. This algorithm has ensured a measurement resolution of 1 cm (when the field of view range is 3.6 m), as well as the measurement accuracy equivalent to that of the conventional contact type water gauge (pressure type etc.).

(2) Stable measurement in various environments such as strong wind, rain, etc.

Our unique image matching technology ensures the measurement accuracy by correcting blurred images under windy conditions etc.



Results by WDIC (when the water level is from normal to increased)
Water level graph, overview image, processed image



WDIC under various environmental conditions
(Upper left: Heavy rain, Upper right: Night, Lower left: Heavy snow, Lower right: before and after flood)

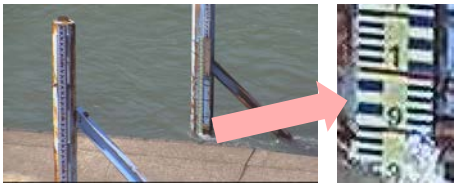
3. <u>High-sensitivity full HD sensor captures high-definition images regardless of day or night</u>

(1) Integrated high-sensitivity full HD sensor enables water level measurement with clarity even at night

The water level can be measured with high-accuracy using high-definition full HD images. The high-sensitivity full HD sensor allows you to capture clear water level images*2 even in the dark.

*2: Minimum object illuminance 0.03lx (color/video), 0.0002lx (color/still image 8-second storage time)

Detection sensor [Zoomed in]



High-definition full HD image

Monitoring camera Detection sensor

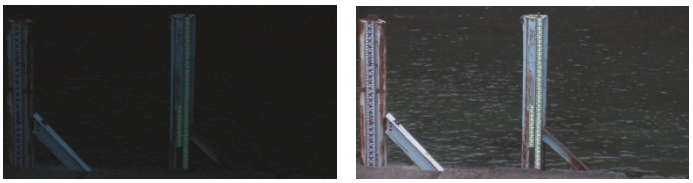


Image comparison between a general monitoring camera and our detection sensor

(2) Developed flexible area photometric control function

With the newly developed "Flexible area photometric control function", the water level can be stably measured even under severe monitoring conditions such as reflection and scattering of light on the river surface.

Example of improved clipped shadow

Monitoring camera Detection sensor

Example of improved clipped highlight

Monitoring camera Detection sensor

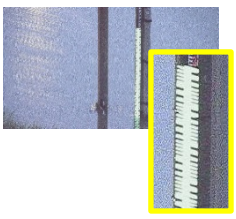


Image comparison between a general monitoring camera and our detection sensor

Other features

1. <u>Easily view past measurement data or provide information</u>

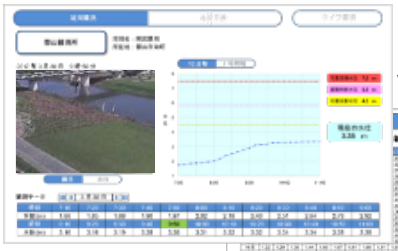
(1) View past measurement data (water level, image)

Since the data (of water level/image) for the past year is accumulated in the main body of the device, you can easily check the water level graph and monthly table on the browser and obtain the data.

(2) Provide river overview images

The river overview image can be provided by masking specific areas such as private houses etc., considering neighboring residents' privacy.

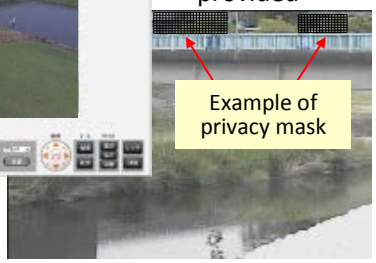
<Overview>



<Monthly water level table>

<Live monitoring>

<Image to be provided>



2. <u>Provide real-time information using high-accuracy water level measurement and high-definition images</u>

This IP network-enabled gauge allows you to build the system easily with optical IP network, cloud network, etc.

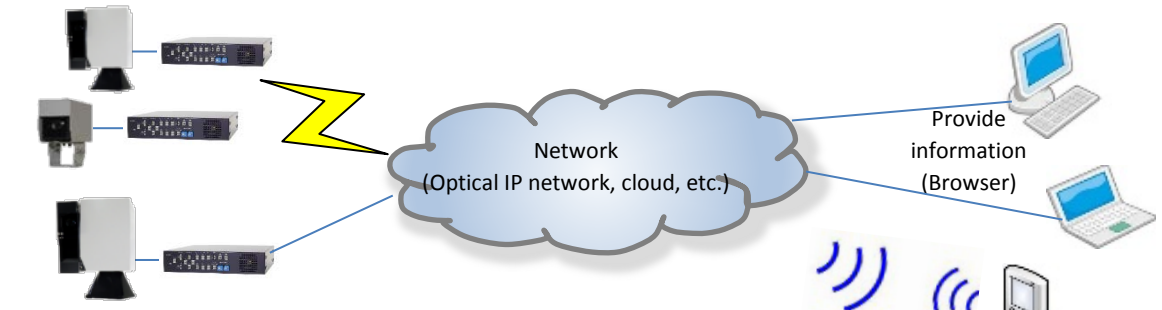


Image-based water gauge
"Field Edge"

Key specifications

(1) Detection sensor (Fixed type) VS-100

Item	Specification
Sensor resolution	1920 Horizontal x 1080 Vertical
Minimum illuminance	0.03 lx (electronic sensitivity OFF, color), 0.0002 lx (electronic sensitivity ON 8 seconds, color)
Zoom lens	20x
Backlight compensation	Area setting available (Flexible area photometry)
Field of view settings	Available (16 points)
Noise reduction	Available (3 levels)
Protective structure	IP66 (JIS C 0920 Powerful water-jet-proof type)

(2) Detection sensor (Multi-point type) VS-1300

Item	Specification
Sensor resolution	1920 Horizontal x 1080 Vertical
Minimum illuminance	0.03 lx (electronic sensitivity OFF, color), 0.0002 lx (electronic sensitivity ON 8 seconds, color)
Zoom lens	20x
Backlight compensation	Area setting available (Flexible area photometry)
Linked settings with field of views	Available (16 points)
Noise reduction	Available (3 levels)
Rotation angle	Horizontal: ±175°, Vertical: ±90°

Maximum rotation speed	Horizontal: 180°/sec, Vertical: 100°/sec (Preset)
Stopping accuracy	±0.02°
Others	Wiper, defroster
Protective structure	IP66 (JIS C 0920 Powerful water-jet-proof type)

(3) Measurement processing unit VS-300

Item	Specification
Processing method	Water level image analysis method (WDIC) for water level board AI-powered water level measurement method (WDL) for pier
Image coding method	JPEG (Processed image: FullHD) (Delivered image: Full HD - QVGA)
Measurement target	Fixed: 1 water level board, Multi-point: 8 water level boards
Measurement accuracy	WDIC: ±0.3% F.S. (depending on measurement target of water level board) WDL: ±0.6% F.S. (depending on measurement target of pier)
Measurement resolution	WDIC: 10mm, WDL: 20mm (Measuring range: 3.6m, still water)
Measurement interval	1 to 10 minutes (1 fps processing for 30 seconds)
Measurement angle of view	16 points (linked control with water level board)
Measurement position adjustment	Available
Data to be saved	Water level and still images in 10-minute intervals
Data storage period	12 months (Stored in the main body CF)
Display	Current water level, water level graph, monthly water level table
Image monitoring function	Maximum 1 frame/second, live image display
Interface	100BASE-TX (TCP/IP, HTTP, FTP)

Others

(1) Terminology

(a) Deep learning: A method of training computers using teacher data to learn and execute tasks performed by humans, instead of using programs.

(b) Neural network: A connection of nerve cells (neurons) in the human brain expressed in the form of mathematical model called artificial neuron.

Trademarks

Patents

Currently four patents have been registered and we have many other patents pending.

Product inquiry

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Supplements:
Delivery of this product to specific customers has been completed by March 20th as shown in the additional supporting documents (optional) # 1 "Evidence of Shipping".
This press release is an announcement to other general customers concerning the sales of mass-production products.