Intelligent Industrial Safety Management Solution for the Safety of Field Workers

SAFEWATCHER

SPHERE AX

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Integrated Management System for the Safety of Field Workers

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01. Introduction

Introduction

Enforcement of Serious Accident Punishment Act

A law imposing duty to make sure the chief executive **ensures the health & safety of workers**

Enforcement on Jan. 27, 2022
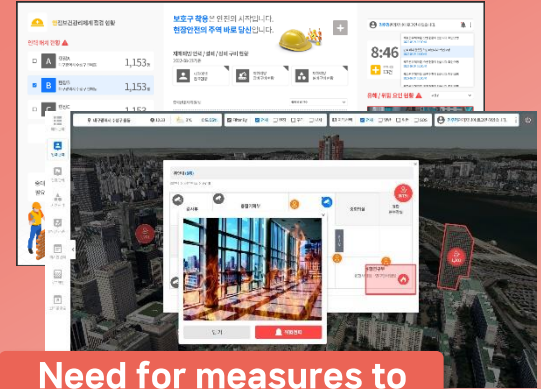(2-year grace period for business sites with less than 50 workers)

Persistent Incidents/Accidents

2021 Coupang Electric Short-circuit Accident

2022 Gwangju Hwajeong I-Park Collapse Accident

2023 Incheon Geomdan Apartment Collapse Accident

...

Need for measures to prevent accidents

Need for real-time site safety management in connection to selective control system

Verification & improvement of harmful and dangerous factors via real-time management of health and safety status

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02. Necessity

Necessity

Serious Accident Punishment Act

① Serious Accident Punishment Act enforced on Jan. 27, 2022.
(2-year grace period for business sites with less than 50 workers)

② Imposes duty to chief executive so as to ensure the health and safety of all people working in a business or on a business site

③ Strict punishment is given in case of a serious industrial accident due to violation of duties by the chief executive.

④ [In case of death] Imprisonment for more than 1 year or fine less than 1 billion Won
[Other] Imprisonment for less than 7 years or fine less than 100 million Won

Solution

Location-based safety control system must be established for zero disaster of field workers and efficient safety management.

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Capable of comprehensive situation management through real-time control of worker location/biometric data & issues

✓	Site & area setting
✓	Worker location/attendance & absence management
✓	Heavy equipment management
✓	On-site drawing management
✓	Real-time control of danger
✓	Reporting of work completion

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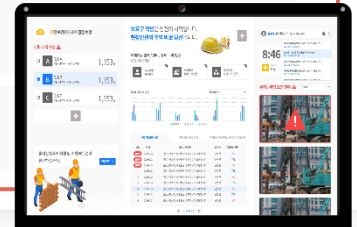
03. Overview

Overview

Comprehensive situation management by connecting location and biometric data of field workers, sensors, and CCTVs based on GIS to prevent serious accidents.

One-stop management of health & safety status

Real-time control of dangerous situation

3D & realistic info analysis

✔ One-stop management of worker & operator attendance, registration mgmt. of heavy equipment, Harmful/dangerous factors

✔ Supports real-time control and response to dangerous situations in connection to selective control system

✔ Indoor/outdoor integrated positioning & human traffic flow tracking
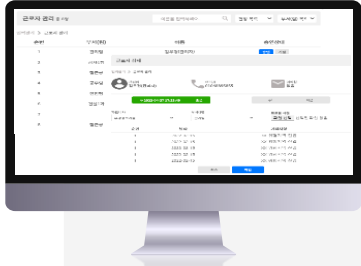
✔ Event processing via real-time video image analysis

Integrated Management System for the Safety of Field Workers
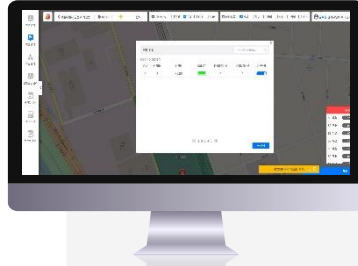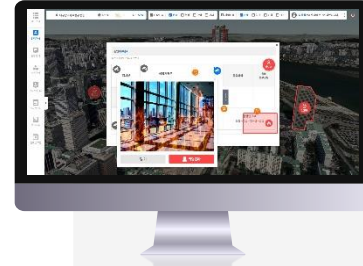
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04. Major Functions

Major Functions

Manpower & attendance/ absence, rights management function

Field & resource management function

Real-time control & risk alarm function

Log mgmt. & other function

Safe Checker integrated mgmt. function (Integrated dashboard)

Purpose-specific detection function

Detailed Functions

01 – Manpower & attendance/absence, and rights management function

Detailed Functions

- ✔ Worker & operator attendance/absence management

- ✔ Designation of worker by area

- ✔ Alarm target person registration

- ✔ Management of menu rights by operator
  - By partner, dept., work type, etc.

✔ Expected Effect

▶ **Efficient management** via worker info registration (attendance, work area, etc.) and **creation of various environments for detecting dangerous situations**

Worker & organization management screen
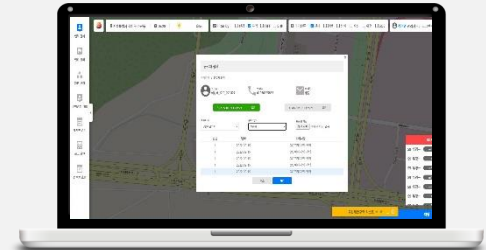
Worker registration & dept. assignment screen

Detailed Functions

Detailed Functions

✔ Heavy equipment registration management (collision prevention, etc.)

✔ Field area setting management (Add/delete)
- Convenient setting using drawing tools
- Displays Geotiff & CAD(shape) drawing layers on the map

✔ Capable of setting whether collision alarm is checked

✔ Capable of registering/checking issue info (photo, file, etc.)

✔ Expected Effect

▶ **Efficient management & detection of dangerous situation** through field & equipment registration
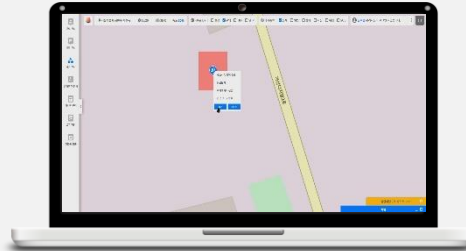
Heavy equipment
registration mgmt. screen
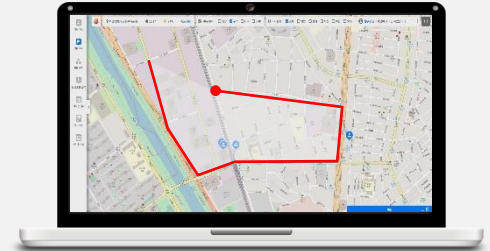
Field area setting
(Drawing tool) screen

Detailed Functions

03 – Real-time control & danger alarm function

Detailed Functions

- ✓ Quick response to issue situation in connection to selective control system

- ✓ Event processing through real-time video image analysis

- ✓ Provides dangerous situation analysis & alarm by major issue
  - Equipment collision prediction/analysis/caution alarm
  - Worker health condition analysis/alarm (Safety gear wearing/tripping/fall, etc.)
  - Analysis/alarm of dangerous situation for workers (Entry to restricted area, SOS for emergency)

- ✓ Capable of registering/checking issue info (photo, file, etc.)

✓ Expected Effect

▶ **Capable of real-time issue situation control & rapid response** through connection with selective control system

Issue detection screen
linked to Selective Control System
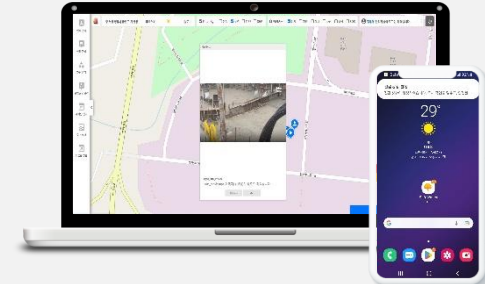
Urgent/dangerous
situation dissemination &
alarm screen

Detailed Functions

Detailed Functions

- ✔ Work & movement log management (displays time-specific tracking)
- ✔ Records detected risks through bio-signal of workers
- ✔ Prepares and uploads Safe Checker event list/status/checklist by situation
- ✔ Sends push messages and displays on nearby CCTVs
- ✔ Function for sharing photo/video images of on-site risk information

✔ Expected Effect

▶ **Capable of real-time issue situation control & rapid response** through connection with selective control system
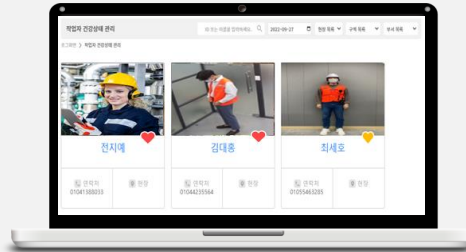
Worker bio-signal checking screen
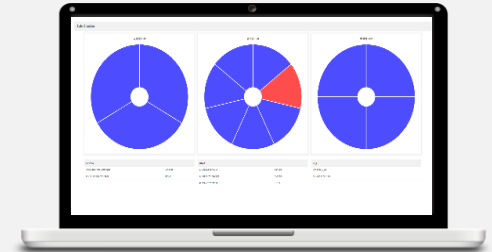
Situation-specific checklist preparation and upload screen

Detailed Functions

05 – Integrated management function for Safe Checker (Integrated dashboard)

Detailed Functions

- ✓ One-stop management of Health & Safety management status
- ✓ Establishes harmful & risk factor checking & improvement measures
- ✓ Supports communication function for listening to voices from workers and for improvement

Expected Effect

▶ **Manages Health & Safety status evidence data all at once** using integrated management dashboard
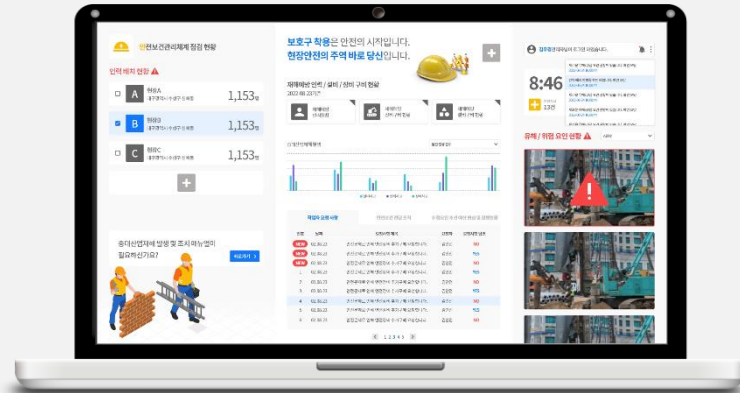
Integrated management dashboard Safe Checker screen

Detailed Functions

06 – Purpose-specific detection function

Detailed Functions

- ✓ When major event is detected in CCTV image, it notifies the location coordinates of the target to nearby workers and sets off an alarm

- ✓ Detects workers within area set in the video analysis module (Detects workers, and entry into restricted area)

- ✓ Detects condition of a worker from the CCTV image and sends a notification of situations such as safety status or unworn protective gears to a manager or a worker nearby

✓ Expected Effect

▶ **Detection/analysis of major event situation according to purpose of application** via intelligent image analysis

Smoke (steam) detection	Arc detection	Jamming accident detection	Fire detection

Detection of a workers in an area	Detection of entry into restricted area	Tripping (fall) accident detection	Detection of unworn protective gears

Detailed Functions

Major function	Detailed function	Function description	Remarks
Manpower mgmt.	Worker mgmt.	Capable of checking registered workers and modifying info	
	Operator mgmt.	Capable of adding/deleting operator(administrator) and checking info	
	Attendance/absence mgmt.	Capable of checking attendance/absence of workers	
	Worker registration mgmt.	Capable of adding/deleting workers according to area	
Site mgmt.	Site management	Capable of adding and checking sites	
	Area mgmt.	Capable of adding/deleting/modifying area	
	Issue mgmt.	Capable of registering/checking issue info (photo, file, etc.)	
Resource \mgmt.	Equipment mgmt.	Capable of adding/modifying equipment	
		Capable of setting whether collision alarm is checked	
Operational rights mgmt.	Partner mgmt.	Capable of adding/deleting/modifying partner	
	Dept.(team) mgmt.	Capable of adding/deleting/modifying Dept./Team	
	Rights mgmt.	Capable of setting rights according to administrator grade	
		Capable of adding/deleting/modifying administrator grade	
Bulletin board mgmt.	Announcements	Capable of adding/deleting/modifying announcements	

Major function	Detailed function	Function description	Remarks
Danger alarm function	SOS	SOS alarm is sent to person in charge when a worker identifies danger	Works via Mobile
	Entry/exit	Upon entry/exit of restricted area, alarm is set off to relevant worker	Sent via Mobile
	Image analysis-based alarm	Alarm given to relevant worker based on images analyzed via image analysis module	
	Alert message	Alarm for emergency evacuation given to all workers in case of an emergency	Sent via Mobile
	Situation notice	Alarm for situation notice given to all workers in case of a dangerous situation	Sent via Mobile
	Biological anomaly	Gives off an alarm to the person in charge when biological anomalies are identified.	Works via Mobile
	Equipment collision	Gives off an alarm to a nearby worker when there is a risk of equipment collision.	Sent via Mobile
Log mgmt.	Management of flow of worker traffic	Capable checking flow of worker traffic	
	Details of worker health condition	Capable of checking worker's condition and worker information.	
		Capable of checking CCTV around workers.	
		Capable of checking info about recent location of workers.	
	Safe Checker mgmt.	All Safe Checkers	
Safe Checker	Integrated control screen	Capable of checking statistics by process, space, environment.	
		Capable of checking Notice, Alert, and Log collection status.	
	Process schedule Table	Capable of checking upload of list by process/space/environment.	
	Linkage with video analysis module	Function for detecting intrusion/abnormal behavior	
		Function for detecting biological anomalies such as fall, tripping, etc.	

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06. Operating Specification & System Overview

Detailed Configuration Diagram of SAFEWATCHER

NVR

CCTV
image transmission

Image analysis module

Sends results according to
various situations to
SAFEWATCHER Manager by
analyzing CCTV images

SAFEWATCHER System

SAFEWATCHER Manager

- Detects dangerous situation by analyzing worker location data
  (Intrusion into restricted area, deviation from area, detection of approach to dangerous articles, etc.)
- Manages location of workers and equipment, and work details
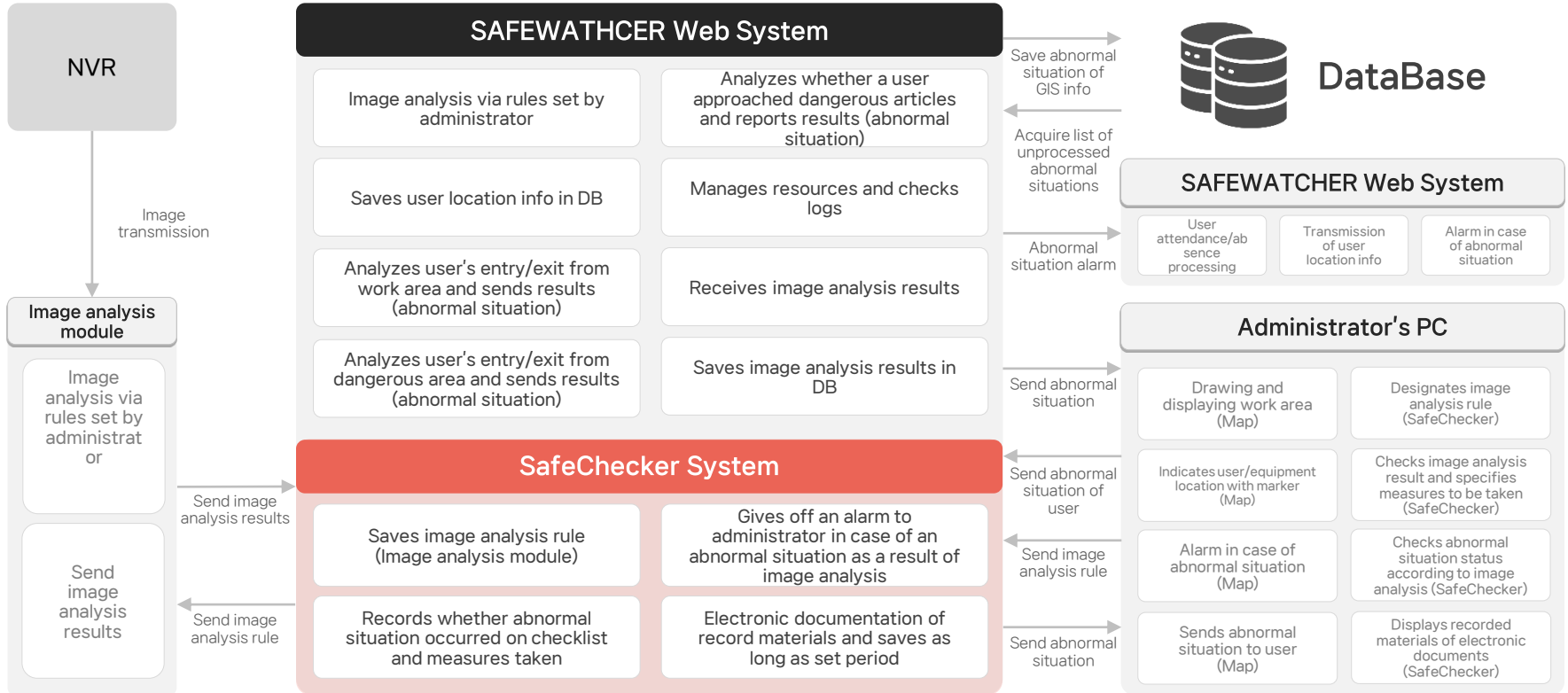- Checks worker's health condition

SafeChecker

- Collects image analysis results via prepared checklist
- Notifies inadequacy or dangerous situation to workers based on image analysis results
- Prepares materials such as reports and details of issues by using analysis result logs

SAFEWATCHER Client

SAFEWATCHER Manager
receives notification of
dangerous situations

Detailed Configuration Diagram of SAFEWATCHER

NVR

Image transmission

Image analysis module

- Image analysis via rules set by administrator
- Send image analysis results

Send image analysis results

Send image analysis rule

SAFEWATHCER Web System

Image analysis via rules set by administrator	Analyzes whether a user approached dangerous articles and reports results (abnormal situation)
Saves user location info in DB	Manages resources and checks logs
Analyzes user's entry/exit from work area and sends results (abnormal situation)	Receives image analysis results
Analyzes user's entry/exit from dangerous area and sends results (abnormal situation)	Saves image analysis results in DB

SafeChecker System

Saves image analysis rule (Image analysis module)	Gives off an alarm to administrator in case of an abnormal situation as a result of image analysis
Records whether abnormal situation occurred on checklist and measures taken	Electronic documentation of record materials and saves as long as set period

Save abnormal situation of GIS info

Acquire list of unprocessed abnormal situations

Abnormal situation alarm

Send abnormal situation

Send abnormal situation of user

Send image analysis rule

Send abnormal situation

DataBase

SAFEWATCHER Web System

User attendance/absence processing	Transmission of user location info	Alarm in case of abnormal situation

Administrator's PC

Drawing and displaying work area (Map)	Designates image analysis rule (SafeChecker)
Indicates user/equipment location with marker (Map)	Checks image analysis result and specifies measures to be taken (SafeChecker)
Alarm in case of abnormal situation (Map)	Checks abnormal situation status according to image analysis (SafeChecker)
Sends abnormal situation to user (Map)	Displays recorded materials of electronic documents (SafeChecker)

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07. Expected Effects

Expected Effects

(Domestic)
Incidents & Accidents and Cases

Coupang Electric Short-circuit Accident
(Jun. 17, 2021)

Hankook Tire Daejeon Plant Fire
(Mar. 12, 2023)

Expected Effects

- Establishment of systematic safety system based on collected info within integrated safety platform

- Prevention of safety accidents via image object analysis & selection system based on AI Deep Learning

- Securing of field worker safety based on GIS/GPS

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