Global Safety Mobiles Management
The 3D Anti-Collision Specialist
Dr. Séverin Kezeu
Inventor & CEO

Doctor Engineer in data-processing and electronic sciences
Robotic and Embedded Technology Expert
Inventor of Navigator Anti-collision technology
CORPORATE PROFILE

Corporate Name: SK Solutions

Headquarters: Office 4003 Al Shatha Tower, Dubai Media City
P.O. Box 502758 Dubai, UAE

Tel: +971-4-3748691

President: Séverin KEZEU

Employees: 150 (As of Dec 31, 2010)

Valuation: 100 Millions USD

Telesud 2006: http://www.youtube.com/watch?v=8MoPXDiE7rw
CORPORATE PROFILE - SK AROUND THE WORLD

SK Solutions Dubai
SK USA
SK Qatar
SK China
SK Saudi Arabia
SK UK
SK - UAE
Accidents in Tower Cranes
CRANES ACCIDENTS
WHILE CLIMBING
CRANES ACCIDENTS

WHILE CLIMBING
CRANES ACCIDENTS

OVERLOAD FAILURE
CRANES ACCIDENTS

BRACING DESIGN FAILURE
CRANES ACCIDENTS
COLLISION
CRANES ACCIDENTS

COLLISION MOBILE CRANE / TOWER CRANE
Implementation of cranes on a building site generates risks which are more or less critical
The goal of the safety managers is to avoid accident risks which cause dramatic human and financial consequences.
WHAT ARE THE RISKS?

- Collision
- Wind
- Overload
- Visibility
- Communication
- Air Craft Beaconing
- Climbing Balancing
- Foundation – Tie in design - Stability
- Maintenance
- Operator competency
THE SOLUTION

GLOBAL SAFETY MOBILES MANAGEMENT (GSM2)
THE FUTURE OF CONSTRUCTION SITES

A Strategic Investment

The implementation of Navigator technology is one of the easiest and most cost effective ways in which to boost safety and efficiency on-site.
GSM2 is the uncontested technology leader in precision and high reliability universal 3D Dynamics Anti-Collision software for any type of mobile vehicle, and the inventor of a new level of excellence as measured by safety, security and productivity all integrated in a global software-based concept named Global Safety Mobiles Management (GSM2).
GSM2 PROGRAM

The SK software program using artificial intelligence and aerospace technology to revolutionize the industry sector is proof that the company’s ambitions reach beyond a “simple” safety device:

- Navigator onboard Platform
- Asteroid ERP
- GSM2Mobile (thin client for mobile devices)
NAVIGATOR: THE MULTI-APPLICATIONS PLATFORM

The GSM2 concept has resulted in the development of the Navigator technology, a sophisticated Multi-Applications Operating System:

- 3D Dynamics Anti-Collision software
- Balancing control
- Wind control
- Load control
- Camera management
TOWER CRANE - COMPONENTS OVERVIEW
CRAWLER CRANE
COMPONENTS OVERVIEW
MOBILE CRANE COMPONENTS OVERVIEW
Exclusive partnership between SK and the American giant Honeywell, the NASA supplier, leading to the introduction of revolutionary aerospace technology sensors in the construction sector.

The first achievement of this partnership, fruit of two years of collaboration, is a sensor integrating a digital compass, an inertial central and a Differential Global Positioning System (dGPS).
STRATEGIC PARTNERSHIP

Rugged-military on-board computer
STRATEGIC PARTNERSHIP

Radio Communication between Cranes

CISCO
MESH NETWORK
All the Construction Sites are connected to the SK Datacenter.
ARTIFICIAL INTELLIGENCE

The Navigator Software Suite:

- the world’s most advanced universal 3D Dynamics Anti-Collision software
- balancing control
- wind control
- load control
- camera management
- VoIP
Navigator Software Suite

3D DYNAMICS ANTI-COLLISION

- Positions and speeds in real time
- Hoist for 3D management
- Load and moment
- Wind speed and direction

Risk of collision
Balancer Control

Aerospace 6 degrees of freedom inertial sensor including compass and DGPS in order to check and control every single crane movement during climbing and working operations (Foundation & Tie in design Stability)
WIND CONTROL
INDICATORS & LOAD CONTROL

- Indicators:
  - Gyro: 47.00°
  - Lift: 143.00 m, 2.00 t, 6%
  - Speed: 58 km/h, 34°

- Dimensions:
  - Main Boom: 28.00 m

- Load Characteristics:
  - MAX TROLLEY: 50.00 m
  - RISK: 70%, DS = 14.69 m
  - MAX LOAD: 3.67 t
CAMERA - NIGHT VISION
We provide you a very high flow ADSL internet connection as well as the self-switching and the terminals necessary to simply and quickly give and receive calls. All our devices include all the functionalities of traditional telephony, with a better quality, and a multitude of new functionalities related to data-processing.
ADVANCED UI (USER INTERFACE)

EASY FOR OPERATORS

IN-DIRECT OPERATOR EVALUATION

Graphical User Interface (GUI)

Multilanguage interface

Multilanguage Audio Guidance Command
TRACKING / MONITORING / BLACK BOXES

MAINTENANCE MONITORING
- Breakdown prevention
- Breakdown detection
- Help for maintenance operations

OPERATIONAL BLACK BOX
- Recording of each cycle
- Alarms
- Breakdowns

SAFETY BLACK BOX
- Anticollision
- Wind
- Overloading
- Audio / Video
CONTROL ROOM

The SK Control Room allows the highly skilled and trained SK support team to efficiently assist customers.

The control room enables the detection of potential issues at a very early stage.
Asteroid ERP stands heads and shoulders above the competition in its on-site capabilities while offering as a valuable addition, a comprehensive range of business intelligence and performance management applications that align personnel, information, and processes in a seamless workflow unmatched in the industry.
FOCUS ON THE REVOLUTIONARY
3D DYNAMICS ANTI-COLLISION
APPLICATION
The anti-collision concept developed by SK consists in giving a type of artificial intelligence to any mobile equipment allowing the avoidance of any risk of collision with its environment composed of other heterogeneous vehicles or systems and motionless obstacles.

It is a formal and universal system that can adapt itself to any kind of mobile: cranes, planes, trains, ships, cars, robots… Furthermore the system is based on ‘object oriented’ technology that allows the integration of all types of vehicles.
THE STORY SO FAR

All the existing Anti-Collision systems around the world are only of Category 1 (= ONLY Driving Assistance System)

The system can map its environment thanks to the sensors

SENSORS = KEY INDICATORS FOR THE ANTI-CLASH SYSTEMS

BUT

WHAT HAPPENS if a sensor is giving wrong information due to malfunctioning or interference by other physical parameters?

It is very important that the sensor signals are correct to justify the quality of the information
THE CURRENT EUROPEAN STANDARD

The Anti-Collision device shall be at least a category 2 device as in 6.2.3 of EN 954-1:1996.

Periodic control required by category 2 may be automatic without crane driver’s intervention or by manual start of the verification in a predetermined position following given periodicity.

PROBLEM

This is only a periodic control. We can’t guarantee that at any time the system will respond as expected…

CONSEQUENCE

Nobody implemened it so far!
IMPLEMENTATION OF UNBREAKABLE ANTI-COLLISION SYSTEMS FOR CRANES

To guarantee an unbreakable system and a high level of safety and reliability, an anti-collision system must be at least a SIL2 (Safety Integrity Level 2) system according to international standards ANSI/ISA-S84.01 and IEC 61508.

Each anti-collision system must include a remote access from the municipality data center in order to check its operational status by inspectors without going onsite.
ABOUT SIL2 STANDARD

A Safety Integrity Level (SIL) is a statistical representation of the reliability of a Safety Instrumented System (SIS) when a process demand occurs. Safety instrumented systems are used to provide safe control functions for processes. SIS typically are composed of sensors, logic solvers and final control elements. SIL is used in both ANSI/ISA-S84.01 and IEC 61508 to measure the reliability of SIS. The higher the SIL (as measured on a scale of 1-4), the more reliable or effective the system.

<table>
<thead>
<tr>
<th>SIL</th>
<th>Low average demand probability of failure on demand</th>
<th>High demand or continuous mode: probability of dangerous failure per hour</th>
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<tbody>
<tr>
<td>1</td>
<td>$\geq 10^{-2}$ to $&lt; 10^{-1}$</td>
<td>$\geq 10^{-6}$ to $&lt; 10^{-5}$</td>
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<tr>
<td>2</td>
<td>$\geq 10^{-3}$ to $&lt; 10^{-2}$</td>
<td>$\geq 10^{-7}$ to $&lt; 10^{-6}$</td>
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<td>3</td>
<td>$\geq 10^{-4}$ to $&lt; 10^{-3}$</td>
<td>$\geq 10^{-8}$ to $&lt; 10^{-7}$</td>
</tr>
<tr>
<td>4</td>
<td>$\geq 10^{-5}$ to $&lt; 10^{-4}$</td>
<td>$\geq 10^{-9}$ to $&lt; 10^{-8}$</td>
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ABILITY TO DETECT FAULTY SENSORS

The ability to detect faulty sensors is crucial in the anti-collision applications.

There are generally four types of sensor failures:

- BIAS (If the output signal is not zero when the measured property is zero, the sensor has an offset or bias)

- PRECISION DEGRADATION

- COMPLETE FAILURE

- DRIFT (slow degradation of sensor properties over a period of time)

Even the system is stable, inaccurate sensor values may introduce errors which may be highly undesirable for the high precision anti-collision
THE SAFETY BELT OF THE CRANE OPERATOR

SENSORS HIGH-REDUNDANCY
+ HIGHLY SOPHISTICATED IDENTIFICATION ALGORITHMS

= ROBUST ISOLATION OF SENSOR FAILURES

= THE SEATBELT OF THE CRANE OPERATOR
SAFETY 24/7

At all times placing safety first

Full redundancy at every level:

- Sensors
- Network
- Bus
- Computer calculations
NEW YORK UNIVERSITY
ABU DHABI