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TECHNICAL SPECIFICATIONS



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This text serves as a technical overview of XBAG, a Computer Based Training (CBT) system designed for both theoretical and practical training in interpreting images generated by X-ray scanners. Additionally, the system can be utilized for conducting certification examinations related to the operation of such equipment.

Reference Legislation

XBAG complies with the specifications outlined in Implementing Regulation (EU) 2015/1998, as published in the Official Journal of the European Union L299 on 14.11.2015. It includes an X-ray machine simulator featuring essential functionalities such as:

- Image enhancement
- Simulation of the conveyor belt sliding.

The system incorporates an extensive library comprising over 15,000 images, 30% of them depicting prohibited items. This collection encompasses:

- about 3500 different baggage items,
- one-third identified as non-threatening or 'clean',
- distinction between "Training" and "Examination" databases,
- for each piece of baggage, the system provides:
 - ✓ Four images displaying the item from different rotations/perspectives,
 - ✓ One image of the open baggage,
 - ✓ One image of the open baggage with overlayed explanations to facilitate threat recognition during training reviews.









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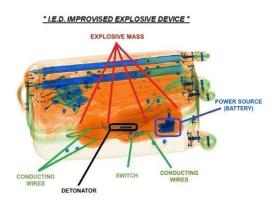












Additionally, XBAG allows for the recording of following data:

- Trainee information,
- o Date and time of the training session,
- o Comprehensive tracking of displayed baggage throughout each session,
- o Detailed tracking of actions performed during each session,
- Thorough tracking of decisions made by the trainee during each session.



N. 25

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N. 28 A234	T CONTRACTOR	ALARM	ALARM	
N. 27 C152		DECISIONE PRESA ALARM	DECISIONE CORRETTA ALARM	
N. 26 A542		DECISIONE PRESA ALARM	DECISIONE CORRETTA PASS	

DECISIONE PRESA

PASS

PASS

DECISIONE CORRETTA

The Computer Based Training (CBT) system is structured to enable trainees to acquire practical skills in interpreting radiogenic images, focusing on the identification of threats and the proficient execution of operational procedures for their effective treatment.









XBAG Objectives

The use of the simulator for training security officers involved in the screening of baggage, cargo, and supplies aims to:

- Prevent and mitigate potential terrorist threats,
- Make training customizable and tailored to the trainee,
- Test the X-ray image interpretation skills of baggage/cargo screeners,
- o Creating a new, interactive, and high-performance training path,
- o Enhance surveillance systems and security levels,
- Strengthen the skills of security screeners and all those working with baggage/cargo scanners,
- o Renew educational methodologies and approaches,
- Streamline methods and timing of the training.











XBAG General Description

"XBAG" (acronym for: X-ray Baggage scAnner Gate simulator) is a Computer Based Training (CBT) software developed for the training of public and private security guards involved in the screening of baggage, cargo and general supplies at airports, seaports, prisons, customs, and other sensitive sites.

General Features

The XBAG software faithfully simulates the use of an X-ray machine, featuring functions such as:

- o Enhancement and manipulation of images using filters,
- o Replication of keyboards and user interface of major X-ray machines,
- Simulation of the conveyor belt sliding,

Additionally, the software provides for:

- a set of regularly updated images featuring real baggage, both with or without concealed threats,
- a software configuration of the simulator and its use,
- a system for overseeing training courses, trainees, and other involved parties,
- an automated system that evaluates the performance of trainees during each training session, in accordance with regulatory procedures.

The simulator is based on a library containing images of real baggage, specifically created to faithfully reproduce realistic operational scenarios.



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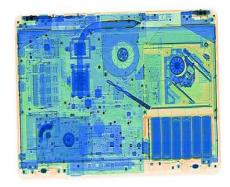


"TANKED AIRBRUSH FOR COATING"

Images are selected and displayed in a completely random and automatic manner, following the parameters selected during the creation of the course (e.g.: operational scope – cabin baggage/hold baggage/supplies/cargo; percentage associated with each prohibited item).

The interpretation and assessment of X-ray images follow a highly realistic and interactive procedural approach, providing the opportunity to explore all the following solutions:

- ✓ Separating the contents of the baggage from its container, when it is necessary to inspect electronic devices;
- ✓ Opening the baggage, to simulate a manual inspection of the displayed baggage;
- ✓ Performing the Explosives Trace Detector (ETD) procedure, to simulate the sampling of suspected explosive substances;
- ✓ Performing the Liquid Explosive Detection System (LEDS) procedure, to simulate the sampling of suspected explosive liquids;
- ✓ Rotating the baggage to obtain a different perspective of its contents.











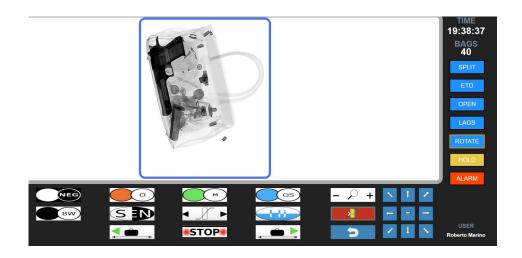
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The simulator functions are activated through a virtual keyboard on the screen, which provides a layout similar to that available on real X-ray machines.

XBAG allows the trainee to select the virtual keyboard from those available, including those of the most widely used X-ray devices. Below are some practical examples.

SMITH:



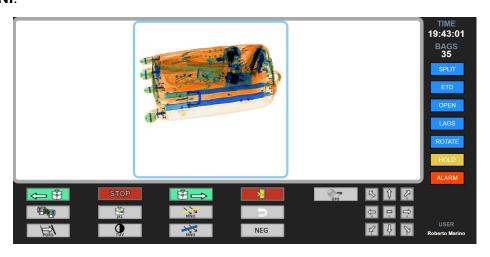








GILARDONI:



XBAG's virtual keyboard library is constantly updated. Replicating a virtual keyboard that fully mirrors reality enables trainees to practice within a virtual dimension that closely simulates real-word scenarios.

XBAG facilitates the assessment and monitoring of trainee performance, ensuring the accuracy of the evaluation process. Any regulatory changes are immediately applied throughout the entire library, effectively reducing the risk of errors during maintenance.

In practical terms, XBAG evaluates the outcome of the training session by analysing the sequence of operations performed by the user, considering the relevant regulations in different application areas (e.g.: airport, ports, customs), and analysing the content of the baggage: for instance, the same baggage may be detained (HOLD) at an airport and allowed to pass (PASS) in a port area.

XBAG allows to assess the trainee's ability to recognize potential threats by tracking the time taken to implement procedures and recognize the items, as well as his ability to make the appropriate decision for each individual case.

The reporting documentation, containing information on performance and course attendance, can be acquired by the trainee at any time. This is a legal prerequisite when applying for the security screener professional certificate.









How to use

XBAG proves to be an effective tool for enhancing the operational skills of security officers engaged in screening procedures. It is versatile, as it can be used for both classroom/webinar and e-learning training courses.

The simulator also includes a selection of common items and objects individually scanned. This allows trainees to understand the difference between various materials and analyse colour variations when filters are applied.

XBAG is accessible online through an interactive web platform, specifically designed to make training more autonomous and customizable, based on the scope in which each security officer operates.

Developed as a self-learning tool to enhance existing training methods, XBAG requires trainees to actively engage in real operational procedures. The primary goal is to improve:

- ✓ Proficiency to interpret X-ray images;
- ✓ Adherence to regulatory procedures;
- ✓ Capability to assess and determine the necessity of 2nd or 3rd level checks for addressing potentially hazardous situations.

XBAG stands out as an innovative and high-performance training tool, as it facilitates handson learning and experience in interpreting images from X-ray scanners, all while evaluating and monitoring individual skills of trainees.

This tool not only streamlines the training process but also elevates the professional standards of security officers, ultimately enhancing security levels at monitored sites.

Traditionally, security officers faced limitations in proper study, practice, and training, requiring supervision in places equipped with X-ray scanners. However, such locations are frequently inaccessible or impractical, especially for those situated on islands, cruise ships, or in restricted-access areas.

XBAG integrates advanced technical content with an innovative training model. It is user-friendly and easily accessible for trainees and instructors, as it only requires an internet connection via PC, tablet or smartphone.





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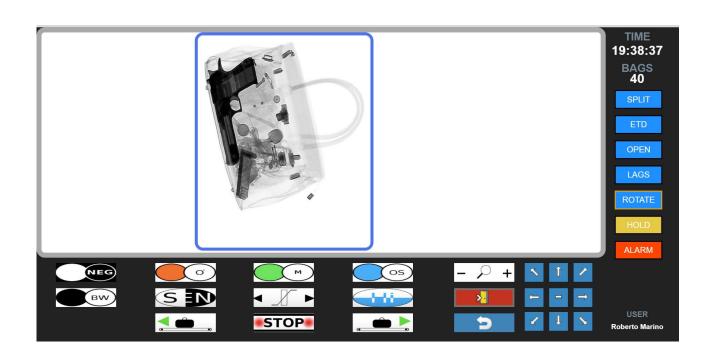




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Functional Features

System operation

The system operates through the following key processes:

- ✓ Preparation of "Virtual baggage",
- ✓ Creation of courses,
- ✓ Management of courses,
- ✓ Training sessions,
- ✓ Report sections,
- ✓ System management.

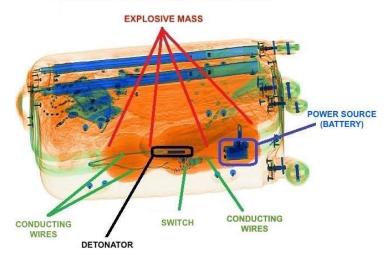
Preparation of "Virtual baggage"

The "Virtual baggage" serves as the central component of the XBAG system.

Each instance of "Virtual baggage" includes:

- ✓ X-ray images of real baggage, specifically generated to features real threats or reproductions of potential threats,
- ✓ Description outlining the contents of the baggage and any specific instructions for its treatment,
- ✓ Illustrative images providing visual representations of the baggage contents.

" I.E.D. IMPROVISED EXPLOSIVE DEVICE "



San Giorgio s.r.l.









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The phase related to the preparation of 'Virtual baggage' is managed by our specialized technicians, who construct the baggage using various types of items to create a rich and diverse image database.

This involves the creation of baggage that includes:

- ✓ One or more threats appropriately concealed within non-threatening content, in order to improve the trainee's capacity to identify threats efficiently;
- ✓ Baggage without any actual threat but designed to potentially mislead the trainee, mirroring scenarios encountered in real-life situations;
- ✓ Baggage with no identifiable threat.

The activity then consists of the following steps:

- ✓ Scanning the baggage in four distinct rotations through a real X-ray scanner;
- ✓ Capturing images of the opened baggage, showcasing its individual components clearly;
- ✓ Categorizing and listing the contents of the baggage as metadata to be linked with the baggage;
- ✓ Generating descriptive images of threats concealed within the baggage,
- ✓ Uploading all captured images, metadata, and additional images into the system through the XBAG back-office functions.





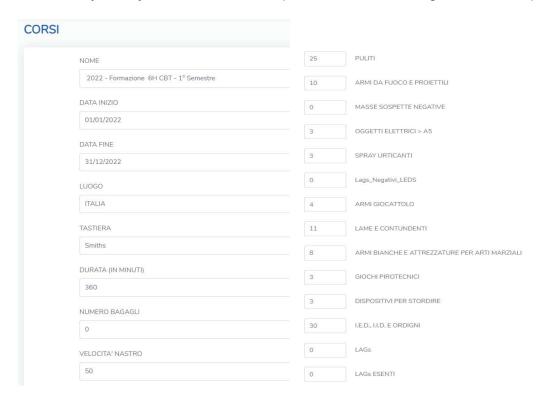






Course creation

The course is a simulated procedure consisting of a set of 'Virtual baggage', randomly selected by the system based on the parameters set during the creation phase.



The procedure for creating a course involves the following activities:

- Generating training sessions by setting:
 - ✓ The time, the number of baggage items to be analysed, or both;
 - ✓ The probability associated with each 'category' of prohibited items;
- Choosing the virtual keyboard of the X-ray equipment to control the simulator functions;
- Selecting criteria to evaluate the suitability of the trainee's actions in accordance with the applicable procedures.

The course parameters depend on the need to fulfil legal obligations, regulatory requirements linked to a specific area, policies related to a specific site, and the requirements for recognizing specific threats or objects.









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Training

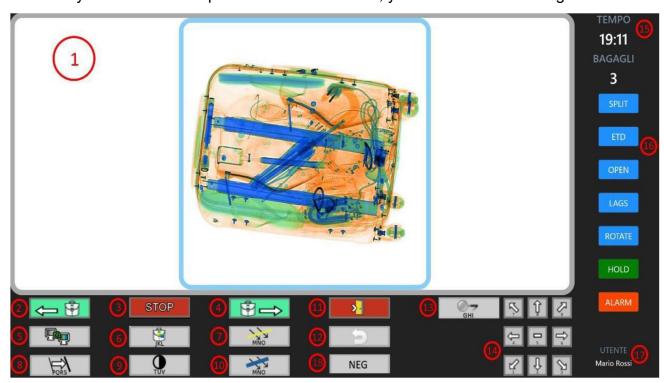
The training phase enables trainees to engage in practice sessions where they virtually implement the same procedures encountered on the workstation.

Baggage will appear randomly, depending on the parameters and the categories selected during course creation.

Trainees can perform the following image enhancement OPERATIONS to facilitate the identification of baggage contents, directly interacting with real scanner functions:

- ✓ B/W or colour filters;
- ✓ Negative filter;
- ✓ Enhancement of organic/inorganic/metal materials, applying colour discrimination filters:
- ✓ Zoom/pan;
- ✓ High penetration filter.

To identify the different components of the simulator, you can refer to the image below:











The white background box (1) simulates the conveyor belt and displays the baggage.

In the top right corner (15), the simulator indicates the remaining time and the number of baggage displayed, while the username is shown at the bottom right corner (17).

To initiate the session, press button (2). This button simulates the activation of the conveyor belt.

To stop the conveyor belt, use button (3); to move backwards to the last baggage displayed, press button (4).

Buttons (5-10) and button (18) apply various filters to the displayed image.

Button (13) zooms in, and button (14) allows movement of the zoomed baggage. Button (12) resets the filters and zoom.

Button (11) allows to exit the session and return to the XBAG home page.

Trainees may take one or more of the following ACTIONS in order to make an appropriate decision on the displayed baggage:

- ✓ OPEN (Photograph of the actual contents of the baggage):
- ✓ ETD (Automatic sampling and analysis of explosive substances):
- ✓ LEDS (Automatic sampling and analysis of liquid explosives)
- ✓ SPLIT (Simulates separation of electronic devices larger than A5 from baggage)
- ✓ ROTATE (Provides 4 different perspectives of the displayed baggage).

The trainee must conclude the image interpretation with a final DECISION, choosing one of the following:

- ✓ PASS: Allows the passenger to proceed freely with their baggage;
- ✓ HOLD: Simulates the detention of minor prohibited items;
- ✓ ALARM: Simulates the intervention of law enforcement:

The PASS decision does not have a dedicated button on the virtual keyboard as it simulates the actual action of allowing the baggage to slide outside the scanner.









ACTIONS significantly influence the time required for baggage analysis and may receive

negative evaluation if improperly taken when it is not deemed strictly necessary.

ROTATION provides four different perspectives of the same baggage, with one of them considered the best view.

SPLIT generates two distinct images, one depicting the electronic device individually scanned, the other displaying the baggage with its contents.

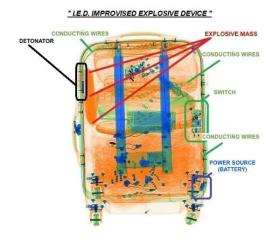












When the baggage analysis is concluded, ACTIONS and DECISIONS implemented are recorded along with:

- ✓ Timestamps,
- ✓ Any associated penalties.









Examination Assessments and Reports

Trainees' performance outcomes are compiled into a comprehensive report.

Instructors can access summarized evaluations of individual students or the entire class, facilitating the organization of targeted training sessions based on specific needs.

Additionally, the system provides each trainee with the necessary documentation for the issuing of participation certificates, as provided for by relevant regulations. These certificates may be subsequently submitted to relevant authorities and other concerned entities.



The training report serves as an extremely practical and fundamental tool for evaluating the performance of trainees. Users can generate different types of reports, with various level of detail according to their specific needs. These reports can be extracted for individual user, specific courses, entire companies, or by entering two or more parameters to obtain a comprehensive report on a specific user and all of their sessions.









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Reports can be generated not only in tabular form but also graphically, providing visual representations of all the activities carried out within the simulator.

N. 867 B112	DECISIONE PRESA ALARM	DECISIONE CORRETTA ALARM	ESITO
N. 866 A075	DECISIONE PRESA ALARM	DECISIONE CORRETTA ALARM	ESITO
N. 865 A059	DECISIONE PRESA ALARM	DECISIONE CORRETTA ALARM	ESITO
N. 864 A712	DECISIONE PRESA ALARM	DECISIONE CORRETTA PASS	ESITO

For example, the 'Image Report' section allows trainees to review all the baggage displayed in a specific session, presenting correct answers, and providing the opportunity to revisit the training session for a thorough analysis of any mistakes made.

Another important report is the **'Examination Report'**. This report allows the examiner to promptly extract the examination results, the percentage of correct answers, and the composition of the baggage displayed, all while automatically evaluating errors for both clean and suspect baggage. Simulator reports are available for download in various formats (.pdf, .xls, .docx) and can also be displayed directly on the webpage.









EXAMINATION REPORT OF FIRST OR NEW CERTIFICATIONSCREENERS CAT. A1-A2-A3

DATE: 11/02/2022

USER DATA: XXXXXXX - xxxxxxxx COMPANY/GROUP: XXXXXX

LENGTH OF THE SESSION: 20 minutes

IMAGES TO BE ANALYSED: 40

SUSPECT BAGGAGE: 28 CLEAN BAGGAGE: 12

CORRECTLY INSPECTED IMAGES: 37 (92%)

PASSED

DETAIL

LENGTH OF THE EXAM: 14 minutes
IDENTIFIED SUSPECT BAGGAGE: 25 on 28

IDENTIFIED CLEAN BAGGAGE: 12 on 12

Within the simulator, significant emphasis has been placed on the examination mode. Creating an examination session is extremely straightforward, as it easily allows for the selection of various parameters, such as:

- ✓ The number of baggage,
- ✓ The maximum examination time,
- ✓ The keyboard.
- ✓ The sequence of baggage that the trainee will encounter.

If multiple trainees participate in the same examination, each trainee will have a unique succession of baggage containing different items.

At the end of the examination, either because the trainee has analysed all the baggage or the allotted time has elapsed, the examiner can automatically generate the examination report, containing all the aforementioned data. The report is modular and can be entirely customised according to the specific needs of the case.









EXAMINATION KEYBOARD



The creation of credentials is fully automated, and access to the examination is contingent on authorization from the examining board.

The system can also incorporate **tests** or **examinations** for the **theoretical component**.

Upon receiving credentials from the examiner, candidates can access the 'theoretical exam' section of the software and complete a multiple-choice test randomly generated from an extensive database containing questions related to all competence categories for the certification exam.

The random generation of questions ensures the objectivity of the examination. Questions are extracted from the initial database in an entirely unpredictable manner, which guarantees that all tests maintain the same level of difficulty and compliance for all examining boards. The results are immediate and can be downloaded in various formats.









System Management

An advanced testing and tracking system for courses and examinations, coupled with the ability to generate standard or customized reports, enables the straightforward and comprehensive monitoring of all trainees' performance.

In fact, XBAG allows for:

- ✓ Managing users, registering, and identifying them as they log into courses, providing control and access to training reports;
- ✓ Managing training paths and tracking trainees' activities;
- ✓ Developing the system, ensuring the continuous update of the baggage database, operational scopes, and keyboards.

Activity tracking is a fundamental monitoring tool available to instructors and trainers to assess the level of learning of the trainees. The entire training path of the trainee is recorded and monitored, enabling the instructor to concretely track the trainee's learning progress at various stages.

Technical Features

The XBAG system is a web application adhering to contemporary international standards, employing a three-tier architecture comprising a Java application server, a standard SQL relational database management system (DBMS), and a web-browser-based thin-client utilizing HTML5.

Access to XBAG is facilitated through an online interactive learning platform, requiring the input of previously acquired access credentials.

The system is hosted on a remote cloud server, enabling comprehensive management of the application without necessitating any software downloads on the PCs of trainees or administrators. In fact, users can access the functions of XBAG using the most common and widespread browsers.

The usability on the client side is ensured for current operating systems and browsers, with a specific emphasis on browsers such as Mozilla, Google Chrome, and Microsoft Edge.