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Inspecta Annual Technical Report

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ABSTRACT

Sandia National Laboratories (SNL) is designing and developing an Artificial Intelligence (AI)-enabled smart digital assistant (SDA), Inspecta (International Nuclear Safeguards Personal Examination and Containment Tracking Assistant). The goal is to provide inspectors an in-field digital assistant that can perform tasks identified as tedious, challenging, or prone to human error. During 2021, we defined the requirements for Inspecta based on reviews of International Atomic Energy Agency (IAEA) publications and interviews with former IAEA inspectors. We then mapped the requirements to current commercial or open-source technical capabilities to provide a development path for an initial Inspecta prototype while highlighting potential research and development tasks. We selected a high-impact inspection task that could be performed by an early Inspecta prototype and are developing the initial architecture, including hardware platform. This paper describes the methodology for selecting an initial task scenario, the first set of Inspecta skills needed to assist with that task scenario and finally the design and development of Inspecta's architecture and platform.

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ACRONYMS AND TERMS

Acronym/Term	Definition
AI	Artificial intelligence
AP	Additional Protocol
API	Application program interface
CRAFT	Character-region awareness for text detection
DOF	Degrees of freedom
IAEA	International Atomic Energy Agency
INSPECTA	International Nuclear Safeguards Personal Examination and Containment Tracking Assistant
ML	Machine learning
OCR	Optical character recognition
ONNX	Open neural network exchange
PIV	Physical inventory verification
R&D	Research and development
RGB	Red green blue
SDA	Smart digital assistant
SNL	Sandia National Laboratories
STR	Scene text recognition
UI	User interface

1. BACKGROUND

The International Atomic Energy Agency (IAEA) Department of Safeguards is responsible for verifying international nuclear safeguards agreements. The mission of international safeguards is "to deter the spread of nuclear weapons by the early detection of the misuse of nuclear material or technology. This provides credible assurances that States are honouring their legal obligations that nuclear material is being used only for peaceful purposes" [1]. The implementation of international safeguards is unique for different states, as they are based on sovereign agreements between a State and the IAEA, as well as from facility-to-facility as determined through a safeguards agreement's facility attachments. Safeguards activities at a nuclear facility are also based on state factors and the IAEA's technical objectives as defined in the Annual Implementation Plan.

Despite these variations, there are many common and repetitive inspection activities performed by inspectors such as reviewing facility bookkeeping, physically inspecting and maintaining safeguards equipment, taking measurements and samples, examining and verifying seals, item counting, reviewing surveillance images, verifying design information, and generally observing a site for discrepancies. These inspection activities are often mentally and physically challenging and thus may be susceptible to human error. Additionally, there is an upward trend in the number of responsibilities for international safeguards inspectors. This increase in responsibilities is a direct result of 1) an increase in the quantity and types of nuclear facilities under safeguards related to the development of novel nuclear fuel cycles; 2) an increase in the global number of significant quantities of special nuclear materials due to the longevity of safeguards for waste products and spent fuel; and 3) a push for inspectors to move from a traditional role of "auditors" in the field to more investigative roles in which activities are defined via technical objectives. Even with these increased responsibilities, inspectors still have limited time in facilities and must work as efficiently and effectively as possible. Efforts to verify additional information associated with the Additional Protocol (AP) will add to this workload.

Artificial Intelligence and its underlying algorithms are prominent and increasingly present in our everyday lives, e.g., cars with automated driver-assistance, online vendors suggesting future purchases, voice-assisted smart home controls, AI/robotic vacuum cleaners, and SDAs like Amazon's Alexa[1]. Integrating these advanced capabilities with international nuclear safeguards inspection processes could increase the effectiveness and efficiency of safeguards activities, especially for those tasks that are tedious, challenging, and prone to human error.

We are developing a prototype for an AI-enabled SDA for safeguards inspectors to support their increasingly challenging task requirements, named Inspecta (abbreviated for "International Nuclear Safeguards Personal Examination and Containment Tracking Assistant"). Inspecta is similar in function to Alexa or Siri[2] as it can aid with tasks such as note-taking, alarms, and timers, but will also have safeguards-specific task capabilities like using optical character recognition (OCR) to read seal numbers. Inspecta will reside on a small, portable, and wearable device that will primarily interact with an inspector verbally, with some capabilities to display information on a screen as appropriate. Note that Inspecta is intended to work alongside humans and not as a replacement for inspectors.

[1] https://developer.amazon.com/en-US/alexa
[2] https://www.apple.com/siri/

In this report, we will share the methodology used to determine a high-impact inspection task that would benefit from Inspecta's assistance, describe the technical capabilities ("skills") required to perform this inspection task, and describe the initial architecture and development status of the Inspecta 1.0 prototype.

1.1. Prior Relevant Work

In 2021, we started with precisely defining what Inspecta would be, developing a list of high-impact tasks performed by IAEA inspectors, and creating a list of technical skills an SDA would need to support an inspector in their tasks. We drew on three sources of information as part of this process:

1. Safeguards task analysis. We began by collecting a list of tasks that inspectors complete in the field, based on IAEA safeguards reference documents. This list was extracted from the IAEA Safeguards Manual under prior SNL work, and we adopted it to frame the types of activities that inspectors currently perform, so we can identify areas where Inspecta may provide support. The task list is at a relatively general level (e.g., "perform maintenance on safeguards surveillance equipment," rather than detailing each task step).
2. Review of IAEA publications of safeguards challenges. The team reviewed several IAEA safeguards publications to identify challenges that inspectors currently face or expect to face in the future. As the team reviewed the documents, we made notes according to the task analysis described in step 1 regarding where publications were identifying challenges, or opportunities for implementing AI, robotics, automation, etc. The documents reviewed for this step include:
    a. IAEA Safeguards, "Emerging Technologies Workshop: Trends and Implications for Safeguards Workshop Report." February 2017 [2]
    b. IAEA Safeguards, "Emerging Technologies Workshop: Insights and Actionable Ideas for Key Safeguards Challenges Workshop Report." STR-397, January 2020 [3]
    c. IAEA Safeguards, "Research and Development Plan: Enhancing Capabilities for Nuclear Verification." STR-385, January 2018 [4]
    d. IAEA Safeguards, "Development and Implementation Support Programme for Nuclear Verification 2020-2021." STR-393, January 2020 [5]
3. Former inspector challenges elicitation. Finally, we identified former IAEA safeguards inspectors, and individuals with related highly relevant experience in facility operations and nuclear materials control. We interviewed eight experts, and documented their anonymized input regarding:
    a. The most difficult or most tedious tasks performed as an inspector.
    b. The inspection tasks most subject to human errors.
    c. The inspection tasks/activities that other inspectors might most trust to automated system.
    d. Perceived challenges of facility operators to meet their international safeguards obligations.

Once we completed data collection from these sources, we documented the potential capabilities for Inspecta and identified the technical capabilities required for each of those. This was done (to some degree) for all inspection tasks, but only a subset of these tasks was further examined and mapped into Inspecta skills and technical capabilities.

We extracted tasks that were identified the greatest number of times during these interviews as (1) surveillance review, (2) Physical Inventory Verification (PIV, in general), (3) transcription, (4) information integration, (5) seals examination and verification, and (6) spent fuel verification.

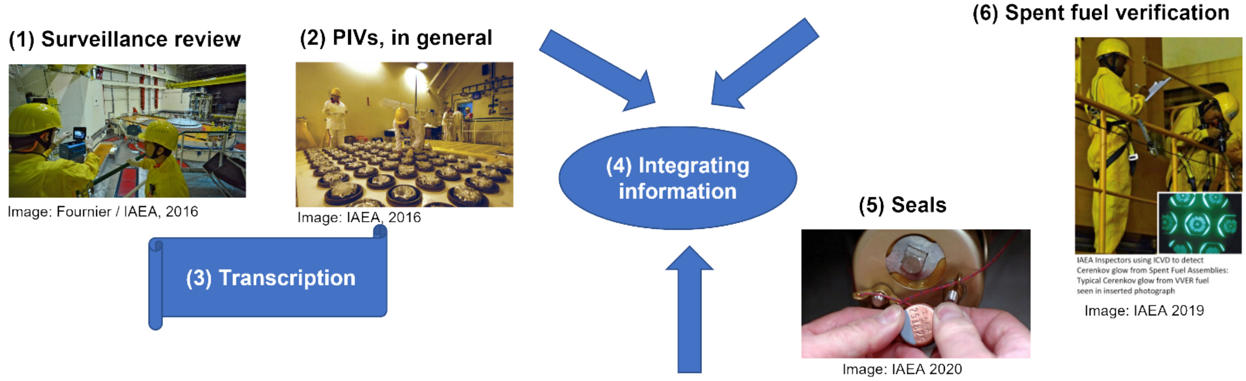

Figure 1: Inspection tasks identified through interviews as most challenging, tedious, or prone to human error.

Transcription and integrating information are often part of the other identified tasks, and PIV is a general term that includes surveillance review, seals, and spent fuel verification – therefore we focused on surveillance review, seals and spent fuel verification as potential Inspecta tasks. Other research and development (R&D) programs utilize machine learning for surveillance review and are investigating using floating robots for spent fuel verification [6]. Further, setting up a surrogate seal examination activity to collect training data and perform testing is easier than a surrogate spent fuel pool. Finally, we considered the technology capabilities that would be needed for Inspecta to assist with a task and ensured that the technology needed is relatively mature with minimal modifications or R&D required. Therefore, the task chosen for Inspecta 1.0 was examining[3] metal cup seals (hereafter called "seal examination"). The skills developed for this task can be re-applied for other tasks in future iterations of Inspecta.

1.2. Task Detail and Skills Needed

The seal examination task is important but tedious for IAEA inspectors. Metal cup seals (Figure 2) with a numeric identifier are attached to labeled containers (Figure 3, Figure 4, Figure 5) after the contents have been measured or verified. An inspector will be escorted by facility personnel to the material holding location, find seals to examine, compare the seal number and associated container number on the item with the numbers on a paper list, and mark that the seal has been examined and confirmed. The inspector also physically inspects the seal and seal wire for signs of tampering, pulling on the wire and seal to ensure proper connection to the container. A small set of seals may be selected for removal and verification at the IAEA headquarters; this selection process is performed using a statistical algorithm that informs how many and which seals should be removed and replaced.

[3] The metal cup seal cannot be fully verified in the field and is removed and taken to IAEA headquarters for full verification. We'll use the term "examination" to include visual and physical inspection and comparing a seal number to a seal inventory list.

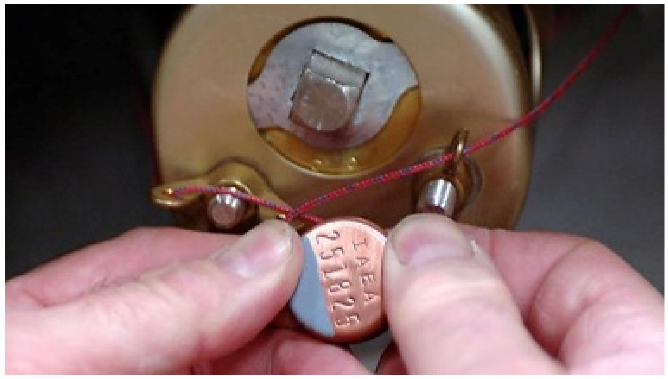

Figure 2: Metal cup seal. Image from [7].

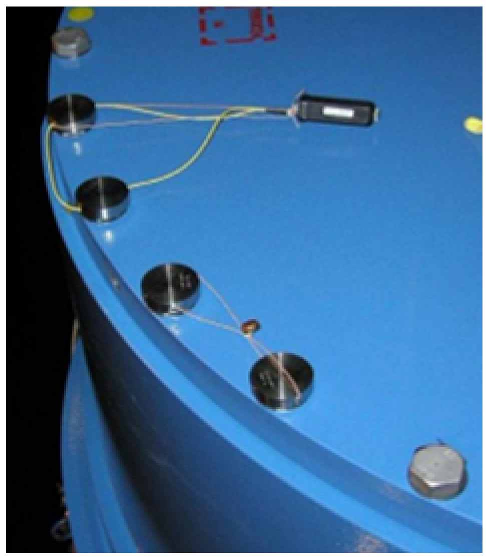

Figure 3: Casks are sealed with two different seal types. Electronic seal is shown on top, and metal cup seal is shown connecting two bolts on the bottom of the image. Image from [8].

Figure 4: Casks can be large, with access to the seal only from the top. Image from [8].

Figure 5: Some facilities have tightly packed casks, and access to seals at the top of casks is achieved via crane or bridge. Image from [8].

Inspecta can provide varying levels of assistance to the seal examination task to support inspectors. At one extreme, Inspecta could fully automate the seal examination task alongside an IAEA inspector. This full automation could use robotics and indoor navigation to locate the area with seals (though a facility escort is still required), use a robotic manipulator arm and object detection to find and grasp a seal, apply OCR to acquire the seal and container numbers and compare to a local database, physically confirm attachment by tugging on the seal and wire, employ anomaly detection to identify signs of tamper, and communicate with the inspector using speech synthesis, speech recognition, and information recall. Figure 6 illustrates skills that would be applicable in this fully automated case.

For Inspecta 1.0, the project scope is significantly narrower than for the fully automated case. The focus is on skills that would directly aid an inspector while still requiring their full involvement in the seal examination task. Namely, OCR is targeted to semi-automate the identification of individual seals, and speech synthesis and speech recognition skills are targeted to simplify notetaking. With Inspecta 1.0, an inspector will still perform physical inspection. Other skills may be added to Inspecta in future versions.

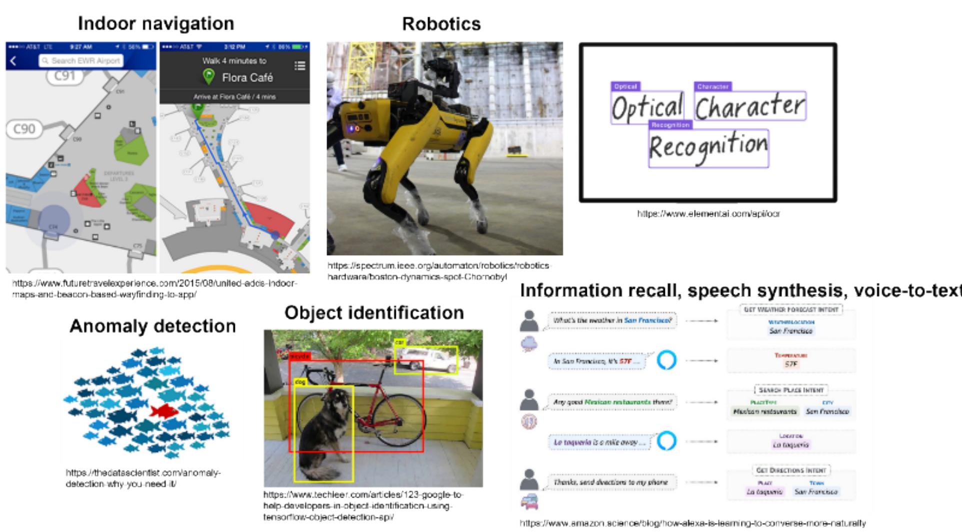

Figure 6: Skills applicable to "seal examination" task.

We envision mainly verbal interactions between the inspector and Inspecta for a seal examination task and have developed a list of basic and task-specific commands containing phrases and words that Inspecta would need to know and be able to respond to. Basic commands include things like "waking" Inspecta, asking for general information like the time or weather, or completing tasks like setting an alarm or recording verbal notes. Task-specific commands are those related specifically to in-field tasks; for Inspecta 1.0, we focused on seal examination. Task-specific commands for Inspecta 1.0 include asking Inspecta to provide a list of things that need to be completed that day, identifying the safeguards equipment needed to carry out a specific task, displaying a list of seals that need to be examined, dictating or recording seal numbers, and marking seals that have been examined, removed, or replaced. A detailed command list is currently under development.

2. ARCHITECTURE

Before development of an Inspecta architecture, we considered high-level requirements that would drive the design. These were mainly centered on security, privacy, usability, and the ability to use and modify previously developed algorithms, libraries, and software components. Hardware that already included many of the input/output capabilities and device sensors was also considered. An early decision was whether Alexa, Siri, or the open-source Mycroft[4] could be used as a baseline to build from, but project constraints eliminated those platforms as options. Alexa and Siri are cloud-based and require connection to servers to work properly. Wireless connections in nuclear facilities are often not available (or reliable), either due to security concerns from the facility or due to signal dead zones throughout the facility. Further, both platforms are proprietary which would limit access to source code and could also be a security concern for both the facility operator and the IAEA. Privacy would be questionable since data is sent/received through cloud-based servers. While Mycroft is open source, there are few turnkey skills available, and relatively limited documentation available. For these reasons, construction of the SDA platform from the ground up was deemed the best development pathway.

The following sections outline the various aspects of Inspecta implementation:

- Hardware Platform – This refers to the actual device that Inspecta is running on, and the interface between the inspector and Inspecta.
- Development Platform – This refers to the platform (i.e., coding language) used to develop Inspecta.
- Application Development – This refers to components needed to run Inspecta that are not related to machine learning. For example, this described UI components, low level device interactions, and supporting code.

2.1. Hardware Platform

Development of Inspecta 1.0 requires a development platform, a hardware device, and both a software application and machine learning algorithms loaded on a hardware device. As mentioned previously, we sought a hardware device that had integral input/output capabilities – namely, speakers, microphone, camera, and display, and chose a smart phone as a candidate. While cellular capabilities are often prohibited in nuclear facilities, there are existing seal readers that use modified cellphones where the antenna has been grounded to prevent communication. Smart phones also have various internal sensors for tracking and navigation, a feature that may be beneficial for future Inspecta versions. Smart phones are small, portable, and can be wearable, which is important since inspectors will be carrying the device throughout the day. While we expect the inspector to interact with Inspecta primarily via voice commands (e.g., "Inspecta, take a note"), a backup method of interaction is beneficial. Smartphones typically have touch screens or on-device keyboards which provide redundancy. Finally, smart phones have reasonable computing power and extended-life batteries and battery extension packs.

Current efforts are aimed at deploying Inspecta on an Android phone (Google Pixel 6) for a demonstration of the seal examination task at the end of 2022. The Android platform was selected due to the ease of development and ubiquitous deployment of the operating system; there are roughly 2.3 billion Android devices that range from phones to embedded devices. This ensures that there are many hardware deployments options and extensive supporting documentation.

[4] https://mycroft.ai/about-mycroft/

2.2. Development Platform

Inspecta is being designed with maximum flexibility in mind. Specifically, Inspecta is being developed on the Xamarin[5] platform. Xamarin is open-source cross-platform code based on .NET that can be deployed as a native application for several platforms: Android, iOS, tvOS, watchOS, macOS, and Windows. Xamarin allows the team to build Inspecta with a single user interface (UI) code base, which significantly reduces the implementation burden. While there is platform specific code that must be written (e.g., code to specifically interact with device hardware), Xamarin enables abstraction of the UI and several other components (e.g., device permissions).

2.3. Application Development

Initial development of the Inspecta application itself is split into several modular pieces. Generally, the UI development occurs separately from the actual Inspecta capabilities (e.g., speech recognition, OCR, etc.) to allow for quicker testing. Capabilities are integrated into the main application once they have been thoroughly tested. Specifics of these modules are detailed in following subsections.

On device machine learning (ML) has been prioritized for data security and privacy purposes. As Inspecta is designed to be cross-platform, a general framework for on device ML was required. The Open Neural Network Exchange[6] (ONNX) application program interface (API) is being used to that end as it supports a wide range of programming languages (Python, C++, C#, C, Java, JS, Obj-C, and WinRT). This contrasts with popular ML frameworks like PyTorch or TensorFlow which often only support direct mobile applications (i.e., direct Android or iOS development rather than Xamarin development). Generally, machine learning models for Inspecta are first developed in Python, using common frameworks (e.g., TensorFlow, PyTorch or Transformers) and then converted to ONNX format. Models are quantized [9] and optimized for mobile performance before being added to Inspecta modules for testing.

2.3.1. Inspecta Main Module

The main Inspecta module is the application envisioned when Inspecta is described in this report. The base application is formed by the Grial UI kit[7], which has a library of common UI elements developed by graphic designers. This UI kit enables the team to develop a professional looking application without needing to hand craft elements (basic widgets in Xamarin are very simple and need additional work to develop if not using a UI kit). FY22 efforts focused on developing UI components relating to the demonstration aimed at the end of CY22. Specifically, this includes elements relating to the seal examination task and a basic inspector note-taking interface. Images from the current build of the main Inspecta module are shown below.

[5] https://dotnet.microsoft.com/en-us/apps/xamarin/xamarin-forms
[6] https://onnx.ai/
[7] https://grialkit.com/

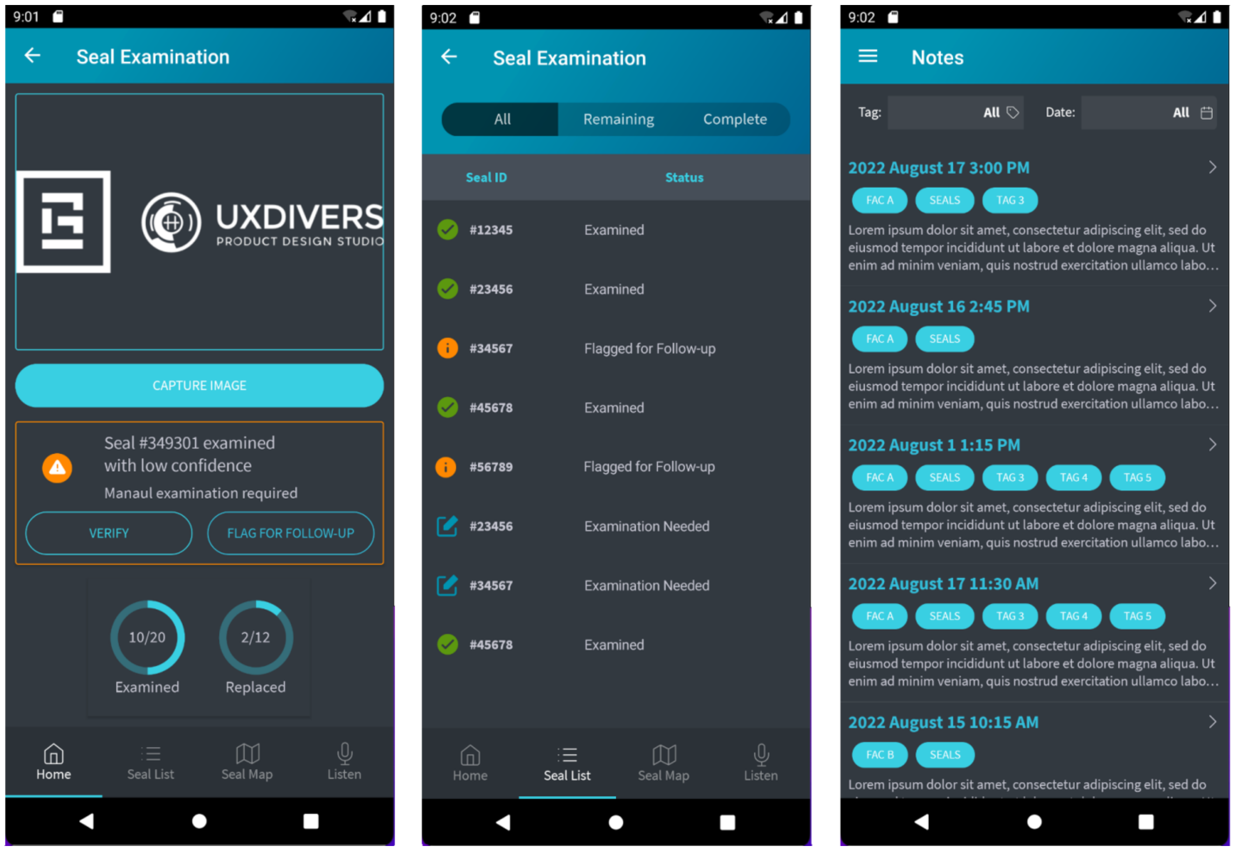

Figure 7: Screenshot of Inspecta UI.

The left screenshot shows the main seal examination display that might be visible on screen as the inspector examines seals. At the top of the screen, there is a placeholder for the last image captured of a seal for OCR. In the middle of the screen, status information is displayed about the last seal examined – e.g., seal #123 was examined successfully, whether manual examination by the inspector is needed, or if some error occurred. Toward the bottom of the screen, the overall status toward completion of the seal examination task is displayed.

The middle screenshot displays the full list of seals to be examined during this inspection along with the status of each seal. The list can be filtered to show only complete seals or only seals that remain to be examined.

The right screenshot displays notes captured by the inspector. The notes can be filtered by date or by tags that have been assigned to each note.

2.3.2. *Inspecta Speech Synthesis Module*

Speech synthesis in Inspecta is relatively straightforward as most platforms have offline speech synthesis. Consequently, the team can leverage Xamarin's cross-platform call for speech synthesis, and in only a few lines of code, speech synthesis is implemented. This module could be improved in the future, if needed, with on-device models for speech synthesis using open-source models like FastSpeech2 [10], DeepVoice3 [11], or similar.

2.3.3. Inspecta Speech Recognition Module

The Inspecta speech recognition model utilizes the Wave2Vec [12] model to perform on-device speech recognition. Currently, speech recognition is implemented through a "press-and-hold" functionality rather than wake word detection. Users press and hold a button while speaking to perform speech recognition rather than using specific listen trigger (e.g., "Hey Inspecta"). Implementation of wake words is complex and may be added later. Speech recognition requires several steps.

First, platform specific code is run to interact with the microphone and record an audio clip, convert from bytes to short int (a datatype required for ML algorithm), and stored to device (due to current limitations, audio is written to a file rather than stored in a buffer). Next, Xamarin reads the recorded audio clip, calls the Wave2Vec model, interprets the output, and returns the estimated text string. Finally, the string is compared to a list of possible commands using Levenshtein distance [13]. Depending on the similarity between the list of commands and text string, Inspecta might execute a command, suggest a command, or return a message stating that it doesn't understand. This module is currently complete and undergoing finetuning for optimized on-device performance. Future development will investigate methodologies that can improve on Levenshtein distance for improved command matching.

2.3.4. Inspecta OCR Module

The OCR module utilizes the on-device camera and ML models to correctly read the alphanumeric designation of a metal cup seal. Scene text (text with complex background) OCR is typically split into two stages, each with a different ML model: text detection and text recognition. Text detection is the task of correctly detecting the text regions against the background of the image or video and setting the appropriate bounding boxes. Text recognition involves taking the bounded image and predicting (in the ML sense) the characters within. Both tasks need to be performed effectively to result in a good prediction: poor text detection can result in bounding boxes that exclude some characters, whereas inadequate text recognition can mis-predict the characters on a metal cup seal.

This two-step approach is implemented using the Character-Region Awareness For Text detection (CRAFT) and a three-stage Scene Text Recognition (STR) module. The three stages of the STR module are Transformation, Feature Extraction, and Prediction. Pre-trained models are used for both text detection and recognition.

The OCR module is integrated into Inspecta to show a real-time camera preview to the user with ML models operating in the background. An alternate approach was considered, wherein the OCR module would only "trigger" upon button-press or image capture, but this method could be prone to issues with lighting, camera angles, or improper focus. This could result in poor ML predictions or requiring the inspector to take multiple pictures, an onerous process when considering the number of seals to be examined. A streaming solution, where the images are constantly analyzed, alleviates this potential burden.

The streaming pipeline is nonetheless complex. In addition to the two-stage OCR process, there are several low-level image manipulations that must be performed. A preview session must be created such that the user can see the camera output. Image resizing also occurs, as ML algorithms do not need large images to perform prediction. Next, a series of image manipulations are performed. Each step is performed at a fixed framerate, which will be optimized to achieve the best user experience.

1. Android preview images are converted from YUV420 images to byte arrays

   a. Android as an operating system supports several different image output formats. While red/green/blue (RGB) formats would be the best format for the ML pipeline, not all devices natively support RGB encoding. The implementation team opted to collect images in a YUV420 format due to its near universal support on devices. This provides more options to the IAEA when selecting devices that Inspecta might run on.

2. YUV420 byte arrays are converted to RGB format
   a. ML algorithms often require a more intuitive RGB format rather than the legacy YUV420 format. This conversion can be slow, so the team uses a low-level Android script to perform this conversion.
3. RGB formatted arrays are passed to ONNX formatted OCR modules
4. Predictions from the OCR modules are passed to the Xamarin to update UI elements

3. NEXT STEPS

The next steps for application development include integrating the speech recognition and OCR modules into the main module and continued optimization and testing to support the December 2022 demonstration (Demo 1.0). Google Pixel 6 phones have been received, and code (currently run using an Android emulator) will be installed on the phones for testing. A more detailed command list is also under development.

We are creating a script for Demo 1.0. The purpose of Demo 1.0 is to demonstrate progress in skill development for the specific safeguards task of seal examination. We will do this by showcasing at least one example of each skill (speech recognition, speech synthesis, and OCR) as applied to the task and several interactions between Inspecta and the inspector (several with Inspecta understanding the inspector's instructions, one with Inspecta not understanding the instruction, and one with Inspecta not able to perform the instruction as it doesn't exist). The newly developed Containment/Surveillance laboratory in the SNL Center for Global Security and Cooperation will be used as a surrogate facility where seals attached to containers are examined and tracked using Inspecta.

Figure 8: Containment/Surveillance lab at SNL to be used for collection of training sets on metal cup seals for OCR and for demonstration.

To broaden the capabilities of Inspecta, we have acquired a Boston Dynamics Spot robot (shown in Figure 9) to test different approaches in human-machine teaming for inspection related tasks – specifically, Spot will be the physical manifestation of Inspecta, and we anticipate first using it (beginning in FY23) to grasp and image seals for analysis by Inspecta. Spot is a commercial quadruped robot equipped with state-of-the-art sensors, cameras, 30 lbs. payload, and a 6 Degree of Freedom (DOF) articulated arm with a single DOF end effector for grasping and image capturing. The robot is controlled with an Android tablet using either direct remote operation or choosing pre-programmed tasks. Operators can string these pre-programmed tasks and create repeatable "missions" for the robot to perform. In addition, Boston Dynamics provides a comprehensive Python API with many of these features, pre-programmed tasks, and missions for customers to incorporate into their own applications. As a result, Spot has been deployed for numerous and novel use cases such as law enforcement, warehouse and factory product inspection, and hazardous areas such as Chornobyl shown in Figure 10.

Using Spot, we hope to create a semi-autonomous robot assistant for IAEA inspectors to rely on when out in the field. This will require, however, formulating an autonomy framework conducive to an IAEA inspector's use-case without obstructing work; ensuring compliance with host facility procedures for safety and security (including escorting requirements); and being safe around humans or equipment in its vicinity. To come up with this framework, we first analyze the information obtained during the extensive interviews with IAEA inspectors and isolate certain tasks that are a good fit for Spot. Generally, these tasks are those that are repeated over short intervals, require operation in static environments, and/or need specialized sensors or cameras. We will then create specialized missions and test them using mock environments set up within the AutonomyNM testbed, an SNL funded robotics testbed used for validating autonomous systems. Once we have validated these missions, we will incorporate them within the Inspecta application for field use. An interesting use case could be German spent nuclear fuel storage facilities where spent fuel casks are packed in tight geometric configurations and only accessible via crane or bridge – we envision Spot performing seal examination by accessing these spent fuel casks from above and using its manipulator arm to reach down, grasp seals, image them, and send the images to Inspecta for analysis – this could reduce inspector radiation exposure.

Figure 9: Boston Dynamics Spot robot with manipulator arm [14].

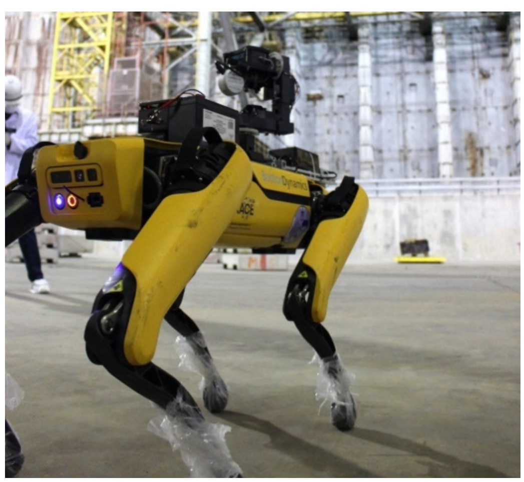

Figure 10: Spot, with a radiation detection payload, deployed at Chornobyl. Image from [15].

Finally, there is a sister project to Inspecta at SNL, Trust in Voice User Interfaces, which is examining factors that influence users' trust in voice user interfaces (VUI). The Trust in VUI team has identified a set of trust factors that could affect a user's willingness to use a digital assistant with a voice user interface like Inspecta. In FY22, the team used the safeguards task analysis performed by the Inspecta team in 2021 to categorize safeguards tasks by the specific action ("VUI tasks") being taken by the digital assistant for each task. Then, the team cross-analyzed these VUI tasks with the set of trust factors and identified intersections most relevant for a seal examination task.

The Trust in VUI team identified two VUI tasks as being highest priority for experimental testing. The first task is "VUI communicates a decision or analysis outcome from underlying models." The trust factors most relevant for this task are explainability (i.e., how did the system arrive at a decision) and confidence (i.e., the level of confidence or uncertainty associated with the model's predictions). The second VUI task is "VUI reads information," with the relevant trust factors being provenance (i.e., what is the source of the information) and granularity (i.e., how much detail does the VUI provide). The Trust in VUI team will begin experimental testing on human subjects in FY23 and will share their findings with the Inspecta team. Their findings will inform the development of Inspecta's VUI capabilities to ensure that Inspecta is developed with user trust in mind.

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