FAQ regarding smart presence detection

Introduction

This document contains a list of frequently asked questions (FAQ) regarding smart presence detection (SPD). The STMicroelectronics Imaging expert replied to these questions during the webinar about SPD. The questions and answers refer to the VL53L7CX and VL53L8CX products.

1 Technical specifications

Which Time-of-Flight sensors support smart presence detection (SPD)?

VL53L7CX and VL53L8CX are the two sensors that can be used for the SPD solution.

Which resolution is used for this solution?

Two resolutions are used: 8x8 in tracking mode, and 4x4 in autonomous mode (sleep mode).

What is the code and RAM size of the smart presence detection library?

The library uses: 117029 bits in flash, 29951 in RAM. Details can be found in the User Guide, slide 40.

Do we need to retrain the existing model such as hand posture algorithm depending on the environment?

No, the solution is not AI based.

Do you have a comparison with a 60 GHz radar sensor for presence detection?

No, ST does not have such a comparison.

2 Detection capabilities

How can these sensors detect motion? Are they fusion sensors?

The sensor has a motion detector feature embedded in its firmware.

How much space is needed between two people to distinguish between one or two people?

ToF sensors are depth sensors. To distinguish two people, the distance is the key parameter, but we do not have a precise measurement.

Can the SPD detect the amount of movement of each user?

The SPD solution gives x, y, z and speed for each user independently.

What would happen if the user is in front of the sensor without moving?

The user can set a no motion timeout. If this timeout is reached, the presence detection jumps to false (autonomous mode).

Can the sensor detect a sleeping person at 350 cm distance? The usecase is monitoring a patient in a home setting.

By default no, because the limit is set to 2 m. However, the sensor is able to range up to 4 m, so this is possible technically.

If lying down and I do not want the light to go off, yet I want it to turn off once I exit the room; how can this be achieved?

You can try the SPD algorithm and increase the "No Motion Timeout" parameter.

Does the device react to pets?

Yes, pets wake up the system.

Is it applicable in an operating room to detect the presence of a patient on a motorized machine?

Yes and you can tune the algorithm to optimize the detection.

Is it able to detect heart rate?

No, the ST ToF sensors monitor user motion, not the heart rate.

Can the human tracking autonomous detection detect a human from overhead (such as mounted on a ceiling) or must the sensor face the human perpendicularly?

The SPD is developed and validated for wall mounted. Ceiling mounted works but not yet fully validated and optimized. It should come later but you can already evaluate by yourself.

Is there any way to detect if a person is a store staff or similar and differentiate them from other people?

This solution and more specifically the low resolution ToF sensor respects privacy. It is not possible to differentiate people.

Are micro movements trackable, for example breathing?

Yes, the sensor can track breathing, but the SPD does not monitor the heart rate.

Can the SPD differentiate a human from an object?

Yes, the SPD is based on this feature and checks for motion.

The sensor detects humans because they are moving/breathing. But will it detect objects if they are moving? For example if an object is moved by the wind.

Moving objects wake up the system, which analyzes and decides if this is an object or a human.

What about a fan, are you able to make the difference with a human?

It will probably keep the system awake. This has not been tested.

Is it possible to track the position and velocity of an object instead of humans?

A moving object is detected as a human, so yes.

3 Development and customization

Can we combine two or more ToF sensors to get a better resolution?

ST provides a solution tested and based on one sensor. It is possible to get better resolution with multiple sensors but there is no need to get better for such a solution.

Can I embed "a part of" SPD algorithm to our product?

STMicroelectronics SPD is a compiled library. You can not split it.

Are all these features inside the device, or is an additional MCU for data processing required?

The sensor data processing is embedded in the sensor. The SPD is an algorithm running on the host (MCU/MPU/...).

Is the driver software only available precompiled for ST microcontroller, or is it also available as pure code for other controllers?

It is available only for Cortex® Arm® core: M0+ M3 M33 M4 M7

Is it possible to use this solution on Arduino? If so, which Arduino hardware do you recommend?

Yes, it is possible to run the ToF sensors on Arduino. Regarding the SPD algorithm, it is not available for Arduino.

Is smart presence detection available on Linux?

It is coming very soon.

Can the SPD library be used with other MCU architectures like RISC-V?

No, but you can contact your local vendor for support.

Does the software also work with the VL53L5CX?

It works with the VL53LCX5 but it has not been validated. For this reason, ST cannot guarantee any performances.

4 Power consumption and efficiency

What is the typical power consumption when the solution is running?

As indicated in the user guide, the power consumption is 0.9 mW in autonomous mode and 28.1 mW in tracking mode.

We need an ultralow power mode. Can we switch the sensor on every 1 second for a few milliseconds to detect changes, and then go back to "sleep"?

Yes, you can use the autonomous mode (sleep mode) like in the SPD.

5 Future developments and enhancements

What is the lifespan (in years) of the VCSEL of a VL53L8CX?

ST dToF sensors have a 7-year longevity commitment. VCSEL is part of the module. So, they have at least 7 years longevity.

Once the 7 years are over, will there be a compatible ToF sensor replacement?

There will be a new sensor to replace the VL53L8CX. Currently ST is replacing the VL6180 by the VL53L4CD.

Is this the end, or are there even better turnkey solutions to come?

ST is always trying to improve its solutions. There will be updates in the future to improve performances, to add new features, or to support additional boards.

6 Sensor technology

What is the advantage of ToF compared to a global shutter image sensor?

Privacy, dark conditions, and very light processing resources are the main advantages of the dToF sensor compared to a global shutter image sensor.

Is ToF harmful to the human eye?

ST dToF sensors are Class 1 sensors in terms of laser safety. Therefore, they are not harmful to the human eye. Nevertheless, it is not recommended to put a dToF sensor in front of the eyes.

How do the sensors perform in an outdoor environment? Is this solution immune to the ambient light?

The ambient light strongly impacts the ranging maximum distance. You can compensate by increasing the integration time. But this also increases your power consumption.

Can the angle of the sensor be configured? Or must it be used in the same plane as the detected objects?

For SPD application, it is mandatory to have the sensor perpendicular to the scene. For some applications, like liquid level monitoring, there can be an angle.

Can the device be configured during runtime? If so, what is the communication protocol?

Yes, to change SPD parameters, you must stop ranging, change the parameters, and then start the algorithm again.

Revision history

Table 1. **Document revision history**

Date	Version	Changes
06-Jun-2024	1	Initial release