Interview Guide - Company

This document describes the interviews conducted in the Precog project.

General procedure

Before the interview
- Invitation mail
- Before the interview mail

The interview session
- Introduction and welcome (not recorded)
- Demographics
- Architecture/Foundational Questions
- Process and Correctness Questions
- Correctness Questions (interweave with above)
- Safety Case Questions
- Contextual Questions
- Ecosystem Questions
- Time Permitting: Quality Tradeoff Questions
- Time Permitting: SAE Level Question
- Closing Questions

After the Interview

General procedure

- We will send information to the interviewees before the session.
    - Formal information
    - Share our conceptual model of a perception system in a vehicle (RQ1). During the interviews, the interviewees will get a chance to object if it does not align with their views.
    - Explain the purpose of the study (research goal).
- Interviews will be conducted in English using MS Teams (Zoom?).
    - At least two researchers will be present during the interview sessions.
    - Habib will try to attend all interviews.
- If the interviewee provides consent, we will record audio+video during the meeting.
    - Make sure there is enough disk space on the local machine. (Might be some caching going on)
    - MS Teams automatic transcription will be used, and we will manually post-process the content to fix errors.
- Transcripts will be returned to interviewees for validation.

Before the interview

This section includes an invitation email to attract interviewees and an “Anchoring and formalities” email that shall be sent to the interviewee before the actual interview session.

Invitation mail

Tentative invitation email, feel free to adjust.

Automated driving relies on safe perception combining traditional signal processing and machine learning (ML). ML models are trained on massive amounts of annotated data. However, there is no shared view on how accurate ML-based perception systems need to be for use in safety-critical automotive functions. With what precision shall the training data be annotated? The precision of comparable industrial datasets can vary by order of magnitude. Academic research has focused on how annotation noise influences the output accuracy of ML models. Still, the connection between the datasets used for training ML-based perception systems and functional safety remains largely unclear. Industrial development of ML-based perception systems will remain hampered until we converge quality expectations throughout the automotive value chain.

With financial support from Vinnova, RISE, University of Gothenburg, Annotell, and Zenseact recently started the prestudy Precog to align high-level expectations on ML-based perception systems in autonomous mobility. Precog explores the entire chain from 1) dataset quality, 2) annotation precision, 3) ML model accuracy, 4) perception correctness, to 5) functional safety. Precog includes a series of workshops complemented by in-depth interviews with individual experts and literature studies. After synthesizing all project activities, we will host an open workshop in 2022 to share our findings.

We are currently scheduling group interviews with automotive experts involved in these considerations. Our ambition is to conduct interviews with representatives from all major automotive companies in Sweden involved in developing autonomous mobility solutions. We plan to conduct the interviews in the second half of January and sincerely hope that your organization would like to contribute to our work. We need your help to identify a handful of experts who would be willing to discuss the topic of the Precog prestudy during a 90 min virtual group interview. Academic researchers will moderate the interviews, and only your organization will be represented in the meeting. After careful synthesis of the interviews, during which you will get a chance to validate and remove collected information, we will invite you to a national cross-organizational workshop. During this concluding event, we will discuss the findings and co-learn how to best proceed with future research studies to support the development of automated driving in Sweden.

/Team Precog

Before the interview mail

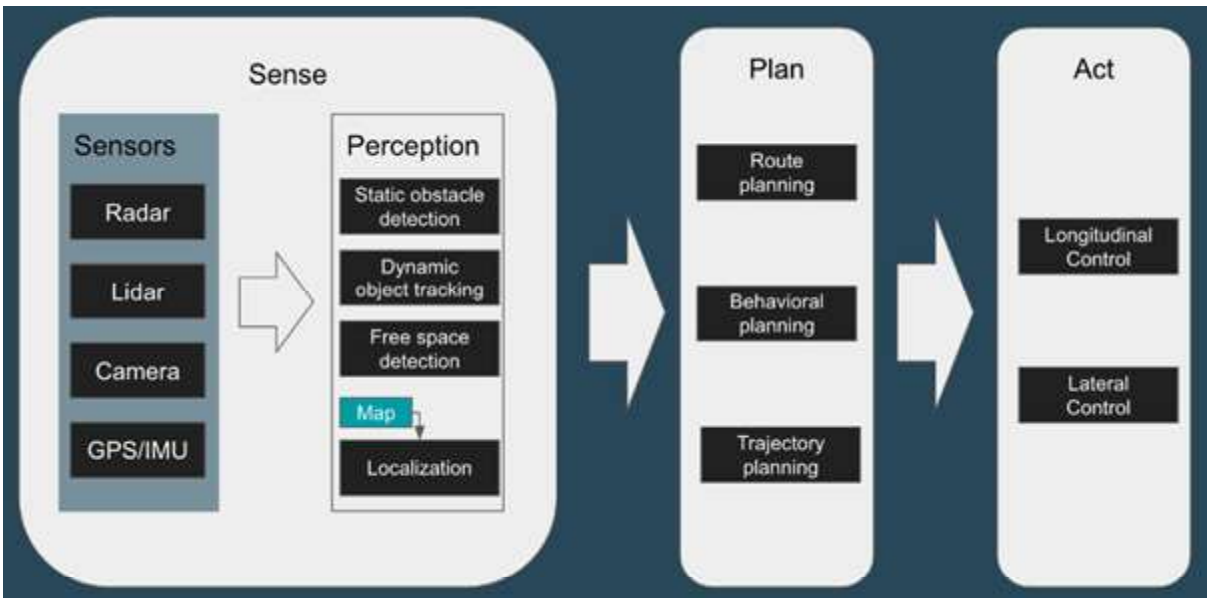
Thanks for agreeing to participate in our pre-study **Precog**! We are conducting interviews to explore requirements engineering for automotive perception systems that rely on machine learning. Precog is a joint project between RISE Research Institutes of Sweden, University of Gothenburg, Annotell, and Zenseact – with financial support from Vinnova. In addition, [redacted] have explicitly committed to supporting this project by sharing their views on the matter at hand.

Formalities and Practicalities
We plan to write a research article based on the Precog results. To support our analysis, we would like to **record the interview**. As an individual interviewee, you are guaranteed anonymity, and no company names will be published in the resulting article. Only the researchers will know which interviewee provided what specific information, and we will, as a first step, remove any personal identifiers from the transcribed interviews. Only high-level codes and possibly selected direct quotes will be shared publicly in the article – with no traceability back to individual interviewees. We will store the recordings and the anonymized transcripts securely on a **Microsoft SharePoint server hosted by RISE** along with a master file containing your contact information – in case we need to validate any findings at a later stage. The content will be accessible only by the researchers and stored for five years after the publication of the research article. At the beginning of the interview, we will explicitly ask you for your consent to store your contact information for the purpose described.

You will participate in the interview **voluntarily**. You are free to skip answering any question and can choose to stop the interview at any time. Furthermore, you can request us to turn off the recording for specific parts of the interview. Please interrupt us at any time if you need us to clarify terms or definitions. We will enable the automatic transcription service provided by Microsoft Teams during the interviews. After the interview, you will **get an edited transcript** per email. You will then have the chance to validate the content, remove any specific information if needed, or further clarify yourself.

If the Internet connection is lost or the meeting fails, please reconnect as soon as possible. If it is not possible to recover within a few minutes, we will reschedule the interview via email.

Aligning the Overall View
The figure below shows a conceptual model of the established sense-plan-act robot control procedure customized as an architecture view for automated driving. Please consider if it matches your context. During the interview, we will ask you to reflect on to what extent it applies to development in your organization.


Sense
Sensors
Radar
Lidar
Camera
GPS/IMU
Perception
Static obstacle detection
Dynamic object tracking
Free space detection
Map
Localization
Plan
Route planning
Behavioral planning
Trajectory planning
Act
Longitudinal Control
Lateral Control

The interview session

Fill in the **fundamental information** in a protocol:

1. Date/Time:
2. Place:
3. Interviewer:
4. Interviewee:

Introduction and welcome (not recorded)

Start with an **informal introduction of the participants** in the meeting. Don't let the interviewee describe his/her entire background – that is part of the interview.

Did you get the instructions we sent you before the interview?

Double-check that recording is ok.

[START RECORDING!]
This is an interview in the Precog project with XX. Today's date is YY.
Can we get your consent to store your contact information for the purpose of the Precog pre-study until the publication date of the resulting article or articles plus five years.

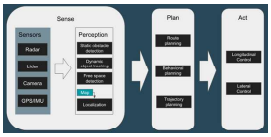
Demographics

Please briefly **describe your current role and your background** as an engineer.

Relevant information includes

- Role in the company? Previous relevant roles? Technical/management?
- Years of experience in the company? In the domain (previous employers)?
- Years of ML/AI experience?

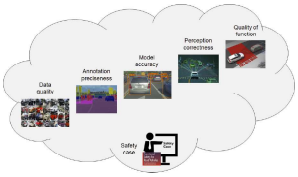
Architecture/Foundational Questions



Refer to Figure 1

- Position yourself in terms of the architecture diagram in Figure 1.
- Is it valid in your context? Correctness and completeness.
- Which sensors are used for perception in your context? (Lidar, Radar, etc.?)

Process and Correctness Questions



Refer to Figure 2

- Is this valid in your context?
- In the context of requirements engineering, where do you actually start in Figure 2? (possibly a chain, possibly everything is interwoven)

- Things are obviously dependent on previous steps.
    - How accurate does vehicular perception be D) to comply with your safety case F) concerning function E)?
    - What are your typical KPIs for “correctness” of an ML-based perception system?
        - Are there challenges or problems in defining and capturing these correctness KPIs or measurements?
    - How good does C) have to be to enable sufficiently accurate vehicular perception D)?
    - How good does B) have to be to enable training of sufficiently accurate ML-models C)?
    - How good does A) have to be to enable sufficiently precise annotations B)?
- Do you have requirements or documentation which capture desired correctness levels for ML-based system outputs?
- Do you specify the desired quality of data used for training? If so, in what form?
- Data quality is not only about resolution of course, but it is one dimension. What other dimensions do you consider?
    - Inspiration: Ashmore et al. (2021) proposed four “desiderata”, i.e., a) relevant, b) complete, c) balanced, and d) accurate.
    - Other data quality models: Data Quality Framework (DQF), ISO/IEC 25012:2008 SQuaRE - Data Quality Model, IBM: accuracy, completeness, consistency, timeliness, validity, and uniqueness

Safety Case Questions

- How does perception system correctness levels relate to safety requirements? How can we map correctness to safety needs?
    - Are there any particular challenges? What is or is not working?
- Is the training process of the ML models part of the safety case?
    - Can/should the training of a ML model be a safety relevant process?
- How do safety cases relate to Fig. 2? Is the figure valid in your development context?
- Are there verification strategies that target quality assurance of the data used for training and testing as part of the safety argumentation?
- How are ML-based perception systems validated?
    - Any simulations?
- Are there challenges or best practices in relating safety cases to data correctness or perception system quality?

Contextual Questions

- How does the context or ODD affect how data correctness is defined and captured?
    - How do you connect data to the ODD?
- Are there challenges understanding and capturing the related context?

Ecosystem Questions

- How well does the negotiation of safety requirements work between the OEM and the supplier of the perception system?
- How are ML-based perception systems integrated to other types of perception systems? Output data? Earlier fusion? Culture clash? Friction?

Time Permitting: Quality Tradeoff Questions

- Do you find tradeoffs between safety and other quality requirements (e.g., performance, security, usability) in ML-based systems?
- Do you balance or trade-off correctness levels with other quality requirements? How?
- Does the desired data quality relate to safety or performance needs? If so, how so? How is this relationship captured?
- Are there challenges in considering correctness and safety along with other quality requirements?

Time Permitting: SAE Level Question

- How do the data quality requirements/correctness relate to the level of vehicle automation as per SAE?

Closing Questions

- Is there anything you expected us to ask that we forgot? Or anything you want to add before we close the interview?
- Who else should we be interviewing as part of this study?

Thank you! and **[STOP RECORDING!]**

You will soon **receive a transcript** of the interview and get a chance to check it.

After the Interview

- Clean the automatic transcript generated by MS Teams.
- Send it to the interviewer and tell them to check it and possibly clarify things.