

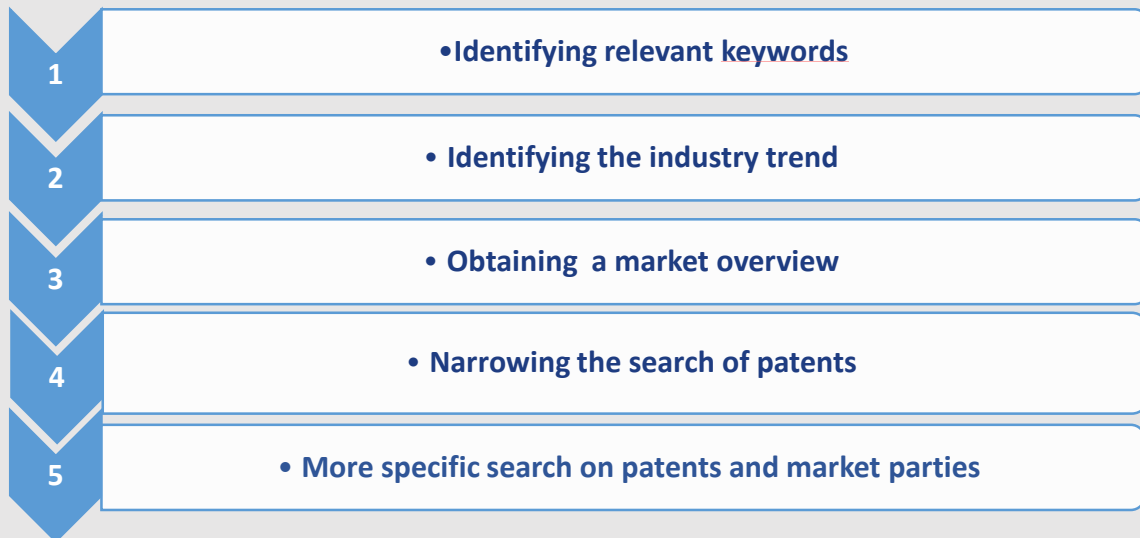
LUCHTVERKEERSLEIDING NEDERLAND (LVNL) AIR TRAFFIC CONTROL

SOTA analysis using the IPlytics intelligent tool

Air Traffic Control the Netherlands (LVNL) aims to emulate the tasks of pilots for the training of air traffic controllers in the Basic, Tower and AAA simulators. A voice recognition and response (VRR) system can improve efficiency and effectiveness in training air traffic controllers. This will have a reduction in costs of staff, while enhancing functionalities required to achieve fidelity and flexibility in complex training scenarios.

Following the EAFIP-methodology, based on the results of the needs assessment, LVNL performed a state-of-the-art (SOTA) analysis. To support the analysis, a five-step-method was performed with the use of the IPlytics intelligent tool, in order to find all information available in the public domain (existing products, ongoing product development, standards and published ideas), and to obtain knowledge of what is protected (e.g., patents identified through the Intellectual Property Rights (IPR) search) and that which is unprotected (e.g., early-stage research in literature). LVNL also identified relevant market parties for the market consultation.

The five steps are as follows:



Below is a summary of the results of each of the five steps.

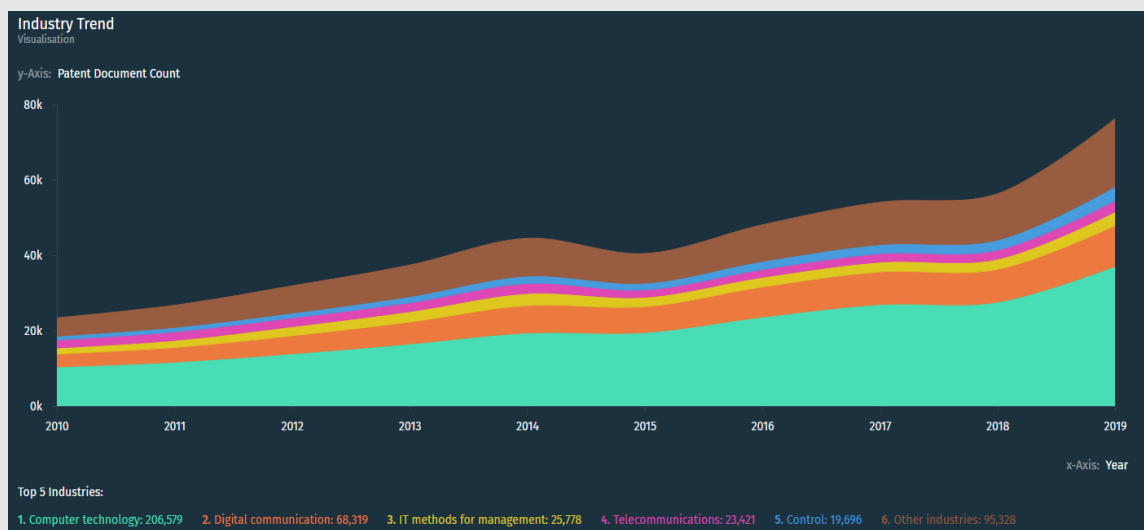
1. Relevant keywords

The following table lists the keywords related to the functionalities and performance that define the requirements of the system, used for the search. The search was further narrowed to the specific ATC domain using related contextual keywords..

Related to the functionalities/Performance (defining requirements of the system)	Related to the context of deployment
Voice recognition and response (VRR)	Air traffic Control
Speech recognition and response	ATC
A.I. and Speech Recognition technology	Training
Voice dictation	Simulator
Speaker identification	Context / situation dependent interpretation
Audio mining	Application interface
Speech verification	
Speech analytics	
Voice model	
Machine learning	
Text to speech	

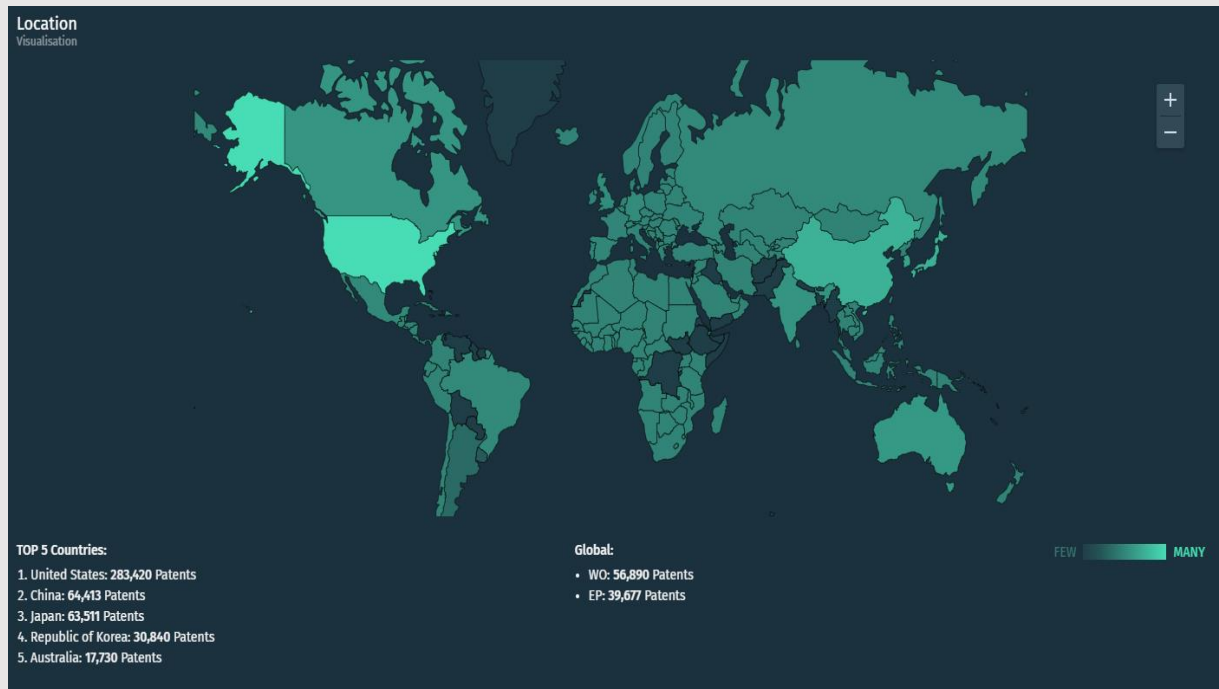
2. Industry trend

The following IPlytics graphic shows the top five industries development in the period 2010-2019.



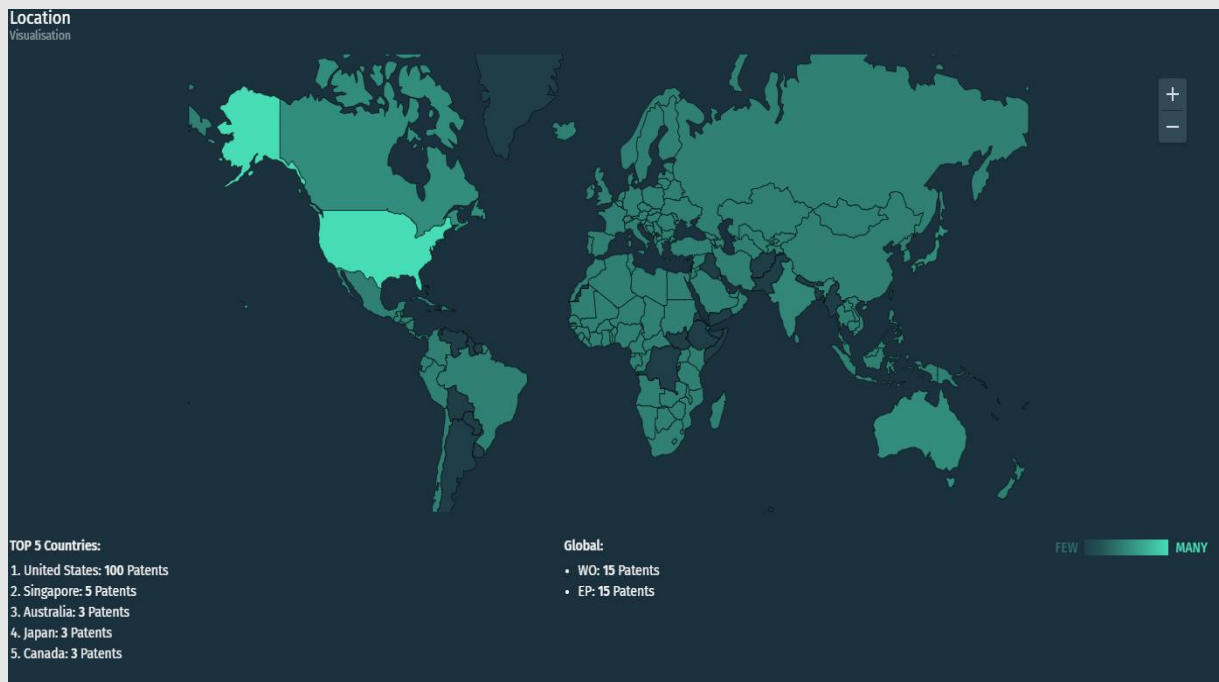
3. Market overview

The following IPlytics graphic shows the top five countries with the number of patents in the world.



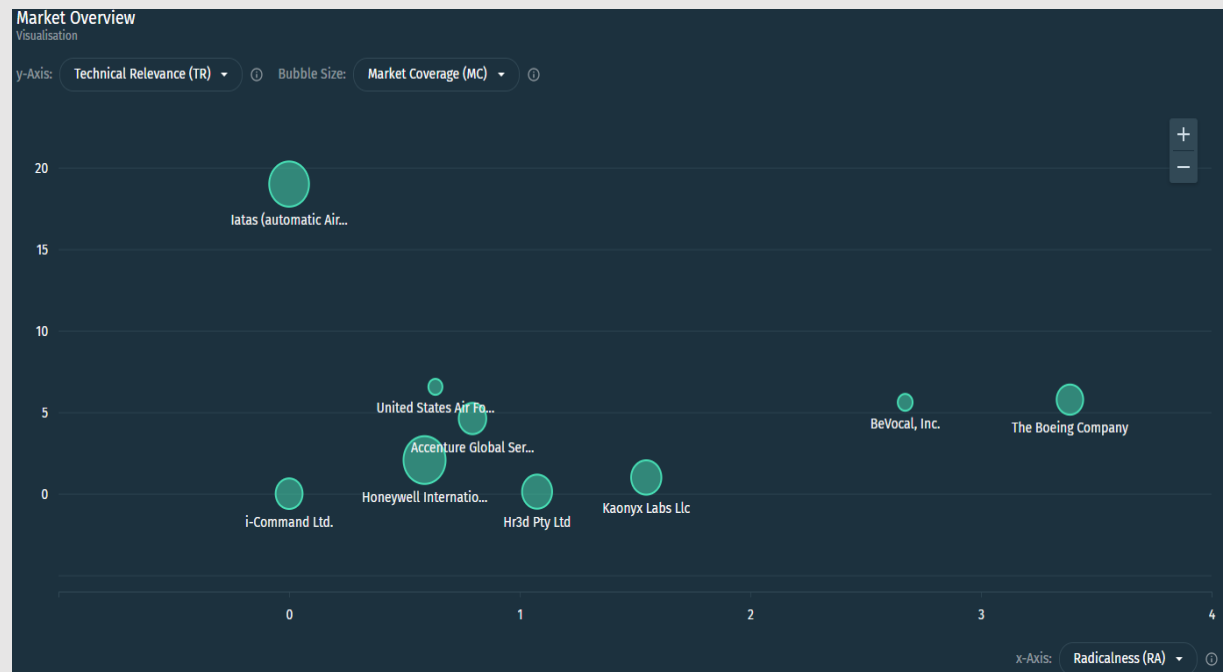
4. Narrowing the search

The following IPlytics graphic shows the results of a narrow search combining keywords, providing the top five countries with the number of patents in the world.



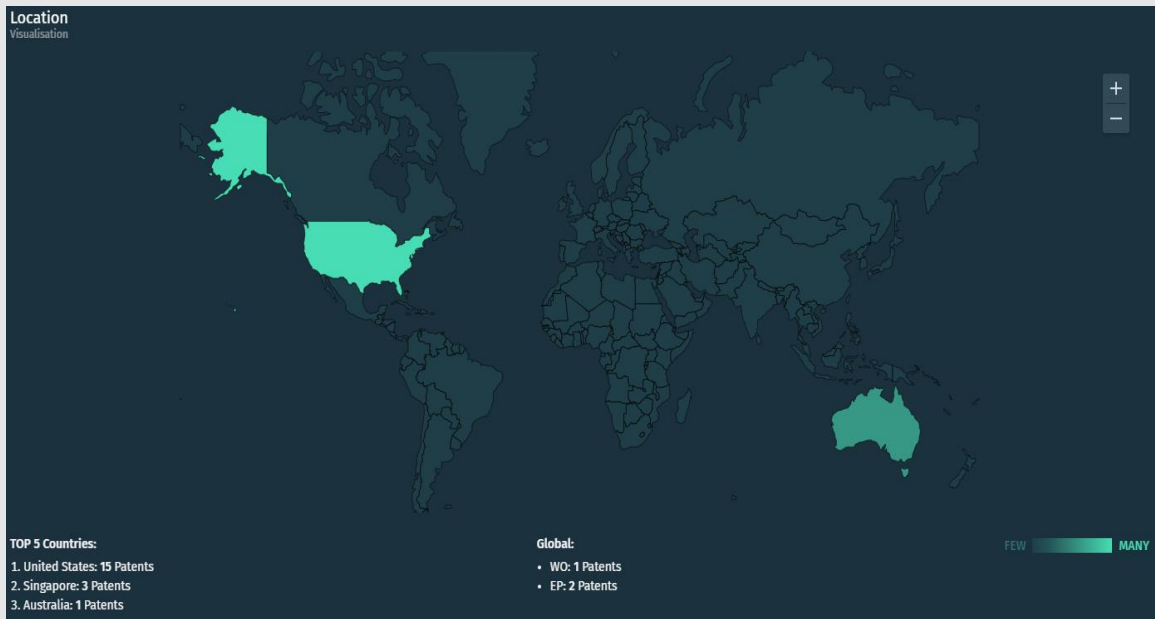
5. More specific search on patents and market parties

The following IPlytics graphic and table show an overview of the market players and patents found based on several criteria (including technical relevance, market coverage and radicalness) as well as the geographic location.



Applicant	Pat. Count	Fam. Count	Market Coverage (MC)	Technical Relevance (TR)	Legal Breadth	Team Size	Cooperation	Radicalness	Scope
iatas (automatic Air Traffic Control) Ltd	1	1	1,6	19,0	2,5	0,4	0,6	0,0	0,9
United States Air Force	1	1	0,7	6,6	1,5	1,6	2,7	0,6	1,3
The Boeing Company	4	1	1,1	5,8	1,6	2,0	1,1	3,4	0,7
BeVocal, Inc.	2	2	0,7	5,6	0,7	1,1	1,3	2,7	0,7
Accenture Global Services Limited	1	1	1,1	4,6	1,1	0,4	0,9	0,8	0,7
Honeywell International Inc.	2	1	1,7	2,1	1,2	0,8	1,1	0,6	2,0
Kaonyx Labs Llc	3	1	1,2	1,0	1,1	0,8	1,0	1,5	1,1
Hr3d Pty Ltd	5	1	1,2	0,1	2,5	0,7	1,1	1,1	1,7

i-Command Ltd.	1	1	1,1	0,0	2,5	0,5	0,9	0,0	1,6
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The results of the prior art analysis are summarized in the following table. LVNL found several patents which are relevant to the scope of VRR in the context of Air Traffic Control (ATC).

		Voice Recognition and Response
Patents	Total	107
	EU/WO* (% of total)	30 (32,1%)
	Top 10 patent Applicants (by TR)**	<ul style="list-style-type: none"> • Airbus S.A.S. • Adacel, inc • Sony Corporation • Ferranti Plc • Honeywell International Inc • Hr3d Pty Ltd • United States Air Force • The Boeing Company • BeVocal, Inc. • Iatas (automatic Air Traffic Control) Ltd

*Patents held in jurisdictions relevant to a European-wide project: Any European country, the European Patent Office, or the World Patent Office.

** Companies to be included in the market consultation

Source: LVNL & <https://www.iplytics.com/>