DEVELOPMENT OF ALEXA SKILLS AS FINAL PROJECT IN ENGINEERING DEGREES

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Abstract

Voice assistants (Alexa, Siri, Google, Cortana) start to be widely used, and their functionalities keep growing. Knowing how to develop apps for voice assistants is a competence that can be very demanded in the near future.

The techniques required are different to those used when developing for traditional devices (computers and smartphones). The way the users interact with a voice assistant is very different to the use of keyboard-mouse combinations or touch screens. On the developers' side, programming voice assistants requires specific techniques which most developers lack.

Subjects related to voice assistant app development are not included in Engineering degrees' syllabus. We are offering the students a way to acquire such competence by carrying out their final projects in this field. Particularly, we focus on developing skills (or apps) for the Alexa assistant, as it is the most widespread.

So far, the students are showing interest in this new proposal for final projects.

Keywords: final project, engineering, alexa, voice assistant, smart speaker.

1 INTRODUCTION

Voice assistants (Alexa, Siri, Google, Cortana) start to be widely used, and their functionalities keep growing. Knowing how to develop apps for voice assistants is a competence that can be very demanded in the near future. A study from [1] regarding smart speakers forecasts an increase from 67 million units in 2018 to 250 million units in 2023. Fig. 1 summarizes such report.

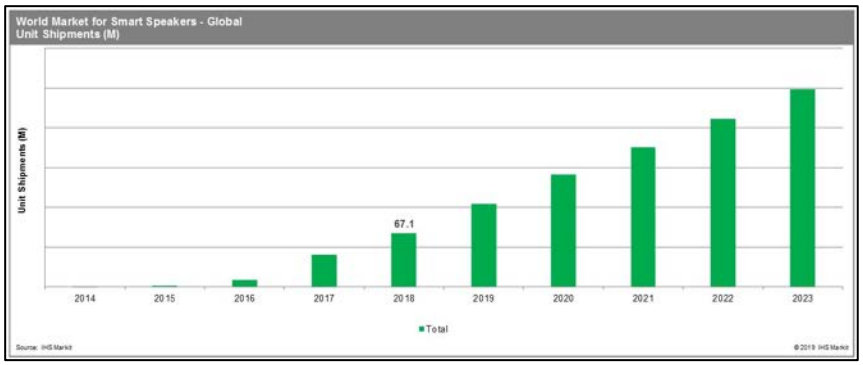

Figure 1. Global voice assistant market forecast from [1].

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We have had extremely good results with previous experiences offering the students final projects which allow them to acquire new knowledge. It is worth mentioning our success with final projects related to face recognition systems, where students learned how to create face databases, how to setup the image

acquisition scenarios, how to pre-process images, how to apply classifiers, etc. [2]. Over the last few years, another topic that has attracted student's attention is Android app development. Similarly, this is a topic that was not included in the University syllabus, but offered useful knowledge to the students, applicable in their professional career. Up to date, 12 final projects on this topic have been finished, and there are 4 more currently active [3]. Applications developed so far by our students cover multiple functionalities, like tourism guides, self-assessment tests, TV guides, war simulators, health apps, etc. A detailed list of recent final projects can be found in [4].

We forecast similar success with final projects related to the development of voice assistant tools. It fulfils the most relevant requirements for being attractive for the students: 1) it can be useful as an extra knowledge for their future professional career; 2) it is a new technology; 3) students are among the users of this technology (although with particular interests, as stated in [5]).

A different type of final projects considers the use of voice-activated robots. They have many similarities with voice assistants, with the addition of having moving parts which, in some cases allow them for displacements, in other cases allow them to show expressions, etc. It may be arguable whether these projects are more attractive for students; see for example [6]. However, hardware requirements may become a barrier for adoption. Besides, voice assistant applications can be developed and tested by the students at their homes, while robot-based projects require the student to be at the University laboratory.

When selecting the voice assistant brand to be used for the projects, multiple factors can be considered, like availability of development tools, development learning curve, etc. There are even studies that compare voice assistants in terms of personality or warmth [7]. For our projects, we have chosen Amazon's Alexa as it is the most widespread and therefore it is more likely for the students to have one of these devices at home. The study from [8] compares the market share of all voice assistants (smart speakers) and shows Amazon's Alexa still clearly in the lead, although Google Home is gaining momentum. Fig. 2 summarizes this report.

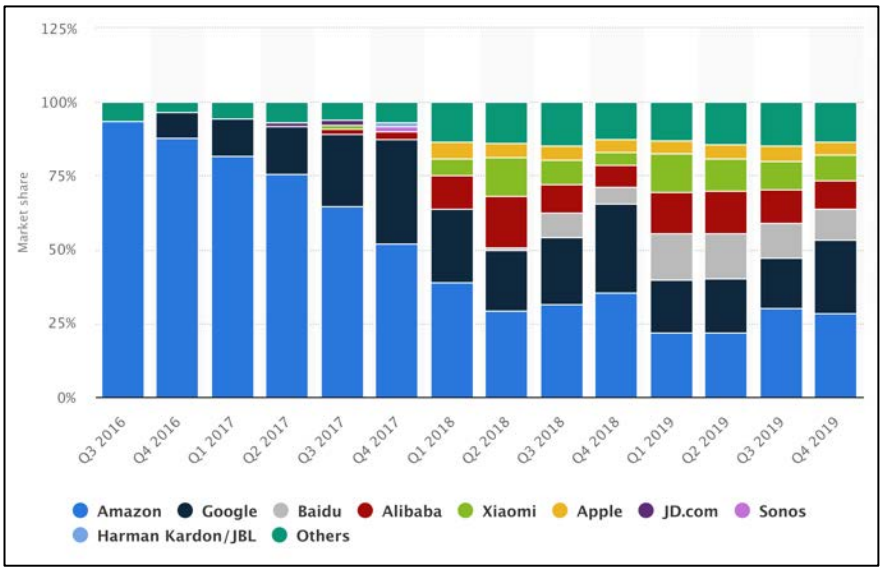

Figure 2. Global voice assistant market share from [8].

Besides, there is plenty of information and tutorials available; see, for example, [9] or [10], as well as Amazon's own developer website [11].

2 METHODOLOGY

An engineering final project usually deals with deepening on subjects taught in the degree. We propose to use the final project to acquire new capabilities which could be useful for the future professional career of the student. Taking this into consideration, it becomes clear that students start from scratch: they have not studied any subject related to voice assistant development.

Briefly, we proceed this way: first, a short course is given to all students interested, so that they learn the basics, where to find information, etc. Afterwards, during the development of the projects, the tutors

give short lectures on specific topics. Meanwhile, all students are guided in the development of their projects.

The students choose which skill they want to develop. It could be a question and answer game related to one of their degree's subjects, a productivity application, etc. Inspiration can be found in multiple skills that have been developed previously with a variety of functionalities: voice interfaces for robotic platforms [12], medication reminders [13], tools for the elderly [14], problem solving applications [15], University campus tools [16], etc.

The tool used to develop the skill is also a student's decision. An introduction to block-based and code-based tools is given to all students. Depending on the programming level of each student, the tutors suggest the most adequate tools.

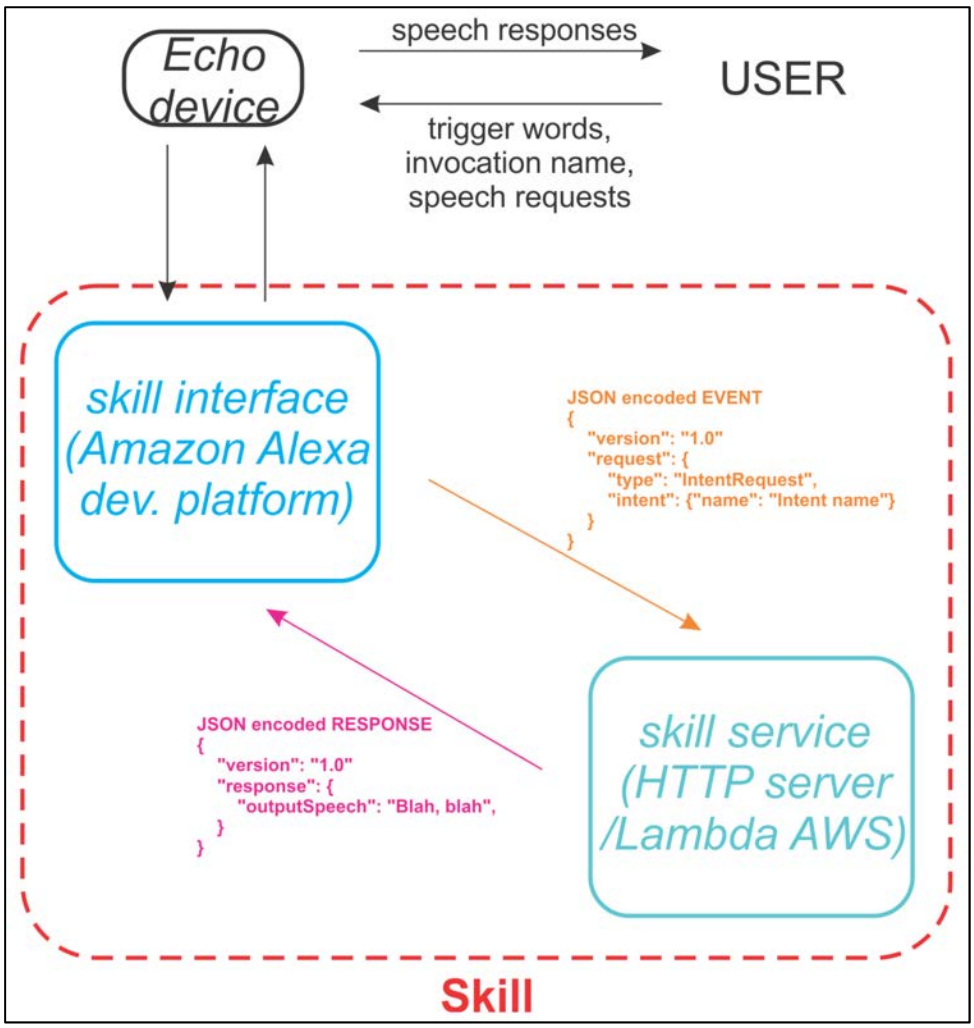

Figure 3. Structure of an Alexa skill from [9].

Our experience with final projects based on Android app development was similar: we let the students choose the development tools. Concerning Android, the tools offered for the students where MIT App Inventor [17], a block-based tool for those students with less coding capabilities; and Android Studio [18], a most powerful and professional coding tool which most students chose.

A voice assistant app (or skill) basically follows the structure outlined in Fig. 3. Basically, there is a speech communication between the user and the device. The device interacts with the skill (or application). Internally, two main elements, namely the skill interface and the skill service communicate through JSON encoded messages.

We offer our students different alternatives for development. The easiest alternative (although currently not available for Spanish language) is the use of Alexa Blueprints. Students more fluent in programming languages can opt for other, more powerful tools, from Alexa Skills Kit.

3 RESULTS

Our results with final projects focused on voice assistant app development are expected to follow the success of previous, similar experiences with Android development. Fig. 4 shows the evolution of the number of final projects per year, grouped by topic.

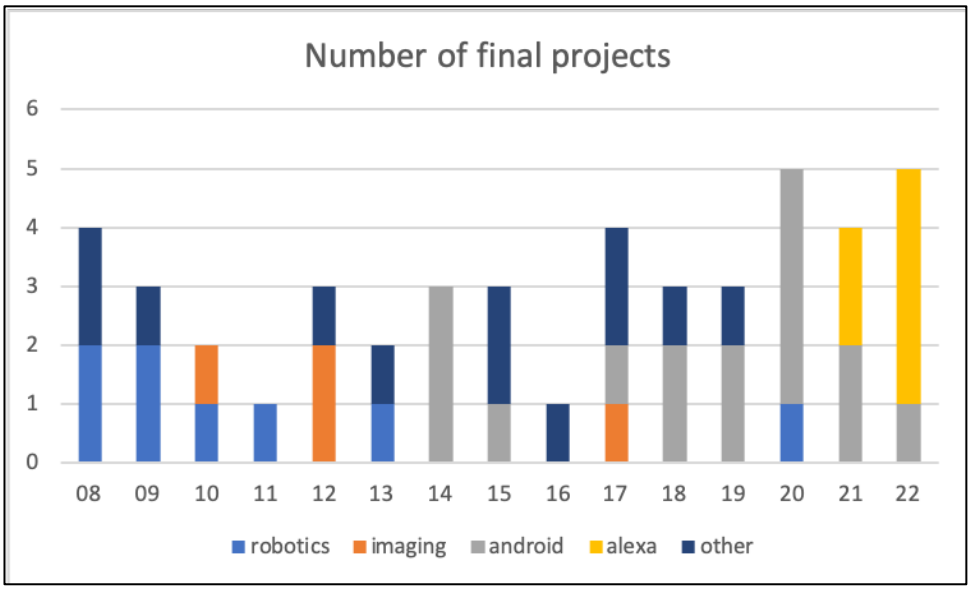

Figure 4. Final projects per year, grouped by topic.

We expect to continue with a rate of 4-5 final projects per year, and to move progressively from Android-based projects to Alexa-based projects, while keeping the high level of satisfaction of the students.

4 CONCLUSIONS

Novel technologies attract students when they are deciding their final degree projects. Over the last years, Android app development has been a highly interesting topic for students. However, mobile app development interest is currently losing momentum among students and a novel technology like voice assistant app can fill this gap.

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