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Immersive Job Taste: a Concept of Demonstrating Workplaces with Virtual Reality

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Abstract: This paper presents a new concept of 'Immersive Job Taste' – interactive virtual reality demonstration of a workplace that aims to give a feeling of going through an average workday of a professional with elements of basic training. The main target audiences of Job Taste simulations are young job seekers who can be aided in selecting a career path at school or a welfare center, choosing the first or a new occupation, often after a period of being unemployed. The design methodology behind the Immersive Job Taste concept includes presentation of a workplace, typical tasks, feedback on performance, and advice on applying for jobs in the specific industry. We developed several scenarios and applied different virtual and augmented reality concepts to build prototypes for different types of devices. The prototypes were evaluated by several groups of primary users and experts. The results indicate a generally very positive attitude towards the concept. In this paper, we discuss the potential impact of applying the concept and directions for future work.

Keywords: Virtual Reality, Career guidance, unemployment.

1 Introduction

Many young people (under 24 years old) in today's labor market are out of work, and the youth unemployment is a serious challenge in many countries [1]. One possible way to mitigate the problem is to better inform, educate and make the young job seekers aware about the possibilities on the market. In this paper, we argue that immersive technologies, such as virtual reality (VR) and augmented reality (AR), have wider possibilities to inform about jobs, professions and career paths than traditional media. Moreover, these technologies are more accessible and accepted by the youth. Many of them play computer and mobile games that give them the feeling of mastery and positive feedback. For this generation, technology is a natural part of life, they are keen to use digital channels and social media to get information about potential study possibilities and jobs.

Traditional career guidance methods and corresponding channels of communication 'lag behind' digitally, so young people feel uncertain about the path they should choose and how and where to get a job. The meeting with work life can be challenging to some job seekers, especially those with social anxiety. Therefore, there is a need to explore new, more efficient and engaging ways to communicate with young job seekers through digital channels, as well as to facilitate informative, motivating and safe working experiences.

Previous research shows that AR and VR are increasingly used in formal education where a traditional classroom is not enough, e.g. to create engaging experiences, visualize complex concepts or simulate learning situations that are difficult to practice otherwise ([2][3]). Use of games and gamification in education and training has been a widely accepted method for many years [4]. These technologies are being deployed by several industries (e.g., mining, healthcare, and manufacturing) and have proven effectiveness in workplace training [5][6][7][8].

As research and practice have made progress in applying immersive technologies in formal education on different levels and at workplace, these have been mostly targeting established professionals and older demographics. Little has been done to prepare job seekers for entering the labor market and to help the unemployed (especially young unemployed) by using immersive technologies. Some work in this direction include VR job interview simulations that have been successfully used for job seekers with mental health issues [9][10]. There have been also attempts to develop apps for career guidance with 360 videos, for example, SORTED application in India (http://www.ilovemondays.in/sorted/).

In order to fill the gap in the current research and practice, we have established collaboration between academia with expertise on immersive technologies for learning and training (Norwegian University of Science and Technology), public sector bodies that manage unemployment offices (Norwegian Labour and Welfare Administration) and related industries that experience lack of workforce and job applicants (Norwegian fisheries and aquaculture industry). In this project we investigate:

- How VR / AR technology can inform and motivate young job seekers, increase their interest in and understanding of workplace processes, and prepare them for job interviews.
- How VR / AR can be used by employers as a tool for presenting themselves to job seekers.
- How VR / AR experiences for job seekers can be integrated with existing career guidance activities at unemployment offices in a sustainable way.

2 IMMERSIVE JOB TASTE

2.1 Immersive Job Taste Concept

The Immersive Job Taste concept is being developed as a way to provide a rich and interactive presentation of occupations with elements of workplace training, targeting a specific group of young job seekers, including high-school students and unemployed. We aim to help young job seekers getting insights into different workplaces via immersive and interactive experiences, which we call "virtual internships". The VR / AR experience will allow the user to train in unfamiliar situations in a safe setting, thus mastering the same real-world situation with the goal of mastering the road to work. Although the concept includes experience of workplace tasks and situations, the objective is not to learn how to perform, but rather how it feels to perform such tasks.

The main idea behind the concept is to capture experiences in the workplace (e.g., daily operations, typical tasks or job interviews), anchored in various work environments. Instead of simply presenting information about something, we seek to deliver applications and content that attempt to convey experiences directly. It is important to note that Immersive Job Taste is different from workplace training as it only provides a 'peek' into a certain profession without necessarily covering all the details of the trade.

VR and AR can be used to 'capture' experiences of physical places and human actions and then present them to the user so that the experience is revived and revitalized [11]. Such capturing is a complex task. It may require a range of technologies applied in a laboratory setting, such as 3D scanning, motion capture and image recognition. However, experience capturing can also be done using wearable sensors in real operational environments, as for example in [12], to be applied for workplace training using AR. Capturing experience to be used in VR requires a different approach. Human actions can be captured with wearable sensors to animate an avatar, but the results of 3D scanning of a physical space cannot usually be used in VR without post processing. Other techniques can be used to capture spaces, such as 360 photos or photogrammetry [13][14].

The concept is developed to:

(a) capture work experiences including physical space, human actions and some of the workplace culture,

(b) enrich them with additional information, game elements and feedback on performance,

(c) deliver them to the users through interactive VR / AR experiences.

2.2 Immersive Job Taste Methodology

The concept of Immersive Job Taste has been extended to a methodology for designing VR and AR applications for different industries or different workplaces. Our objective with this ongoing task is to find the best way to inform and empower a specific target group – young job seekers and contribute to their inclusion in the job market.

In the process of mapping the user needs, we identified several challenges the young job seekers have and possible solutions that are worth exploring. We discovered discrepancies in the perceived reasons behind these challenges between the job seekers and welfare professionals (career counsellors and the labor and welfare administration coordinators). We also collected opinions on using specific features and game mechanics (demonstrated with various apps) in the Immersive Job Taste simulations. The most outstanding challenges included: most participants reported that traditional internships sometimes have low value and that they have difficulties facing job interviews and daily workplace situations. Existing job descriptions were often overloaded with text and provided little insight into the actual profession. The most wanted features were: job-interview simulation and visualization of actual workplaces. The least wanted features were competition mechanics and location-based gaming. Moreover, the users wanted to be able to link the information about the professions to the actual workplaces, tasks, and skills. From the evaluation of early prototypes, the job seekers wanted to get feedback on their actions to build confidence.

The Immersive Job Taste Methodology includes several components. A profession is presented through several typical and simple tasks, which can normally be given to trainees. These tasks are first demonstrated (e.g. as a 360 video) and then simulated in one or multiple workplaces, so that the users can observe how the tasks are done and then try themselves. The objectives of such activity is to convey the feeling (or the taste) of the job and to build confidence, rather than to train. Therefore, assessment needs to take the form of feedback on achievements and errors, tying together the typical tasks, key skills required to perform them and information about the workplace.

Managers at the workplace need to be interviewed to identify the typical tasks and the required skills commonly given in job announcements. Then the skills need to be linked to the tasks, for example, skills A and B are required to perform task X. Next, for each skill-in-task, descriptions of successful and unsuccessful performance need to be made. For example, accuracy in fish sorting task is high if the worker can spot most or all defective fish on a fast-moving conveyor belt. These descriptions should be given to the users as task descriptions, while the indicators of successful performance should be tracked and used in the feedback. All the key skills derived from the job announcements for a specific profession and used in the tasks of the simulation become types of points that users receive when performing well the corresponding tasks. The same skill (or type of points) can appear in different tasks to better convey what it means in a specific workplace, e.g. hygiene.

An actual workplace needs to be captured using different technologies, for example, those discussed in section 1 above or manually modelled. An actual worker needs to perform each typical task to be captured and included in the simulation. For each task, the user should first experience the demonstration of how the task is performed in reality with some explanation of what is going on. Next, the user should actively try to perform the task with some immediate feedback on successfully performed actions or errors. And finally, the user should receive a full feedback on his/her performance in the form of different types of points collected and brief explanations of their meaning in the completed task.

2.3 Concept Development

The concept has been developed through several stages. We started with identifying the needs of the primary users and other involved stakeholders. We identified user needs at a day-long seminar with young job seekers and welfare professionals as a part of generating initial requirements. The concept has received a generally positive feedback, and many possible features have been rated. Guided by the results of this process, we developed Cardboard VR applications for health care, office/startup and fish farming industry. Each of these apps also included a branch-specific job interview. A Hololens app for the fish farming was developed as well. Through testing these apps, the concept has been evaluated and further developed.

The data collected from the young job seekers and welfare professionals indicated a positive attitude towards the concept of Immersive Job Taste and job interview simulations, but also various problems in using the apps with the Google cardboard. The problems reported by the users included difficulty in navigation and interaction, getting cybersick, poor image quality, wearability

issues and similar. The Hololens app was considered "cool" but with a limited practical value.

In the next phase, we implemented the concept and an updated design methodology for more advanced equipment. The fish farming industry (with an extension to the fish processing industry) was chosen for further development. This resulted in the FisheryVR app for HTC Vive (see Section 3.1). In addition, due to the positive feedback on the job interview simulations in the first phase, we developed the InterviewVR app simulating a generic job interview for Cardboard or Gear VR using 360 videos (see Section 3.2).

Both apps have been evaluated in the lab environment (Section 4). A summary of the evaluation is presented in Section 5. The concept and then design methodology are now being updated based on the results of this evaluation.

3 Application Design

3.1 FisheryVR Design

FisheryVR allows to immerse into fish farming and fish processing workplaces, try out six typical tasks and get feedback. The app simulates an area of a typical Norwegian fjord, including floating fish cages, a control and feeding station, a fish-processing facility on shore and a boat to travel between locations. The tasks include cage maintenance checks, remote fish feeding, fish sorting, packing and fillet cutting (Fig. 1 left) as well as health and safety tasks.

Figure 1: Screenshot of the FisheryVR app (left) and the user (right).

FisheryVR app has been primarily designed for HTC Vive. The app can also be used with a Mixed Reality headset Samsung Odyssey. The app is developed in Unity 3D game engine and includes various simulated 3D environments, interactive objects and workplace situations representing typical fish-industry workplaces. The contents of the app have been designed under constant supervision and advice from the Norwegian fish industry: SalMar ASA, Måsøval Fiskeoppdrett AS, and Aqualine AS.

In this application, we designed the physical workplaces using detailed 3D models of the facilities and equipment which we received from the manufacturer. We captured the performance and descriptions of tasks using 360 videos, which were then placed in the virtual environment in the same (or similar) locations they were filmed. We included six typical tasks and six key skills (from 1 to 3 skills for each task).

The application has been implemented in collaboration with local industries, especially in the fish farming and processing sector. The local companies provided us with details of their day-to-day operations, 3D models, participated in 360 filming at their premises, and provided input to job interview scenarios.

3.2 InterviewVR Design

The InterviewVR app has been designed to provide a generic immersive experience of job interview with training functions. In the design, we did not strictly follow the immersive job taste methodology described above. However, the app is designed as a supplement to the immersive workplaces, such as FisheryVR.

The interview simulation is based on a scenario that contains 12 main questions and 14 additional comments or questions that appear optionally depending on the answers to the main questions. All questions or comments were 360-filmed in a single run from the point of view of the user.

The user takes the role of the job candidate and goes through a typical job interview. The app does not provide much guidance and instruction on how to perform at a job interview. Instead, the user is immersed into this situation and has to react to it by answering questions from the interviewer.

The application makes sound recording of the answers provided by the user. This feature has two purposes: to make the user feel that the situation is real and to allow self-assessment and reflection by enabling a playback of the entire interview. While the user is speaking, a short 360-video clip with the interviewer actively listening is being looped.

In the design of the app, we did not use speech recognition and analysis, but still tried to make the experience personal and realistic using more simple methods. We included / excluded some of the questions (videos) from the simulation based on several multiple-choice questions the app asks before starting the interview (e.g., about education and work experience) and based on the duration of the answer (e.g., if the answer is shorter than a certain value a follow-up question is added). We also had questions where the user was given a hint in the form of three possible directions for developing an answer (Fig. 2). In such a way, the user could choose a direction and elaborate an answer, while the interview scenario continues to develop based on the chosen direction.

After the user completes the interview, an option to play it back becomes available. The sound recordings of each answer are played over the same videos. The recording is only stored locally due to security and privacy concerns.

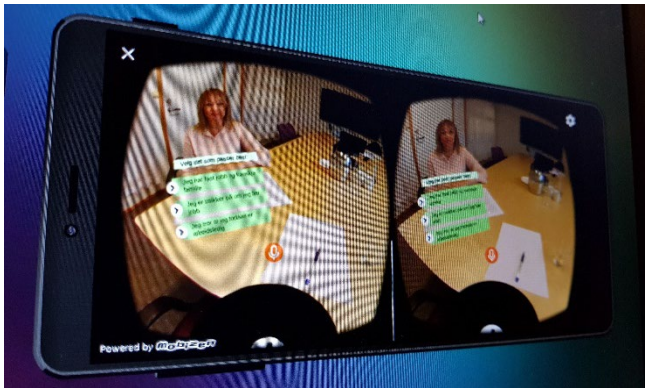

Figure 2: InterviewVR app.

4 Research Methods

We continuously collected user feedback on the two apps and the concept throughout the second part of the project at eight intermediate evaluations and one final evaluation. We used the same or very similar questions in the focus group interviews in all data collection sessions. We also used the same questionnaires, although in some of the data collection sessions, we used shorter versions, excluding some of the questions. It should be noted that

the applications have been gradually improved between different data collection sessions, so the results cannot be fully merged together. However, the presentation of the concept remained the same throughout phase 2 of the project, and the data can be considered a single set.

The primary target group of the study and of the project is defined as young job seekers. Under this term, we include individuals aged 18 to 25 who are using welfare services, such as social or unemployment benefits, and in most cases unemployed. Representatives of the primary target group were 34 male and 21 female with median age 21.5. It should be noted that participation in the evaluations was voluntarily, and we observed a higher interest among male participants than female. We evaluated experience the participants had with gaming and with VR/AR. 49% agreed or fully agreed that they had much experience with gaming, while only 18% reported much experience using VR/AR.

Secondary target groups include high school students, job seekers of different ages and different welfare professionals. In addition, industry experts, researchers and university students participated in data collection. From these groups, we collected background information only for welfare professionals. In total, 10 male, 21 female and 6 unspecified gender professionals with median age 49 participated in data collection. It is important to notice that none of the welfare professionals replied agreed or fully agreed either to have much experience with gaming or with using VR/AR. 72% of them replied that they have little or very little experience with gaming and 86% with using VR/AR.

Each data collection session included a presentation of the Immersive Job Taste concept, testing apps by the participants, and collecting feedback in different formats.

A dedicated section of the questionnaire aimed to evaluate the Immersive Job Taste concept. It was adapted to job seekers (15 Likert scale questions) and welfare professionals (17 Likert scale questions). Both adaptations contained thee open questions. The main topics we evaluated included: usefulness of such VR/AR apps for e.g. increasing confidence, motivation and awareness about the workplaces (6 questions to job seekers and 5 to welfare professionals); if such apps should be offered at welfare centers and schools (2 questions for each group); if such VR/AR apps are fun and easy to use (6 questions to job seekers and 3 to welfare professionals) and if the participants would require technical assistance to use such VR/AR apps (1 questions to job seekers and 2 to welfare professionals)

In addition, we collected information about background of the respondents and various aspects about the specific apps, such as user friendliness, usefulness of the app, and possible future extensions.

To analyze the data from individual interviews and focus groups, the project employed a method similar to theoretical sampling as it is described in Grounded Theory: "the analyst jointly collects, codes, and analyses his data and decides what data to collect next" [15] and thematic analysis and thematic mapping as described in [16]. Questionnaire data were split into topics they evaluate and where analyzed together with the data from the interviews and focus groups. The data from other secondary target groups were analyzed separately and were used as additional indicators in specific topics.

5 Results

In the section, we present the interview and questionnaire results that evaluate the concept of Immersive Job Taste.

5.1 Experience of and Attitude Towards the Concept

Overall, the concept demonstrated via the apps we developed received a very positive feedback from all types of stakeholders. The majority of those who answered questionnaires agreed or strongly agreed that apps developed based on the Immersive Job Taste concept should be made available to job seekers.

5.1.1 Young Job Seekers

"*The possibilities of this project are endless*" (job seeker). The only criticism made was one job seeker who felt that it was an attempt of the Norwegian Labour and Welfare Administration to be "*cool and hip*". Many of the other job seekers used words like "*genius*", "*without limits*", "*a question of when, not if*" and similar praise to describe how they felt about the concept: "*I believe in a few years it will be one of the main tools used in job seeking*" (job seeker). In addition, it was claimed that the concept would be popular among a wide range of people: "*VR is the key to reach people. Both young people and technology enthusiast are interested in VR. They will come pouring in to try VR*" (job seeker).

There was a debate on what to prefer between VR built using 360-degree videos (as in InterviewVR) or full interactive VR built using 3D-modelled environments (as in FisheryVR). The interactive VR had more "to do" (job seeker) and gave more in-depth information about work tasks, while 360-degree video was more immersive because it showed real people in the real world doing real tasks, rather than animated surroundings and tasks (job seeker).

The quantitative data supports the general positive attitude towards the concept among job seekers. Figure 3 shows responses of 43 job seekers to statements about the usefulness of applications built based on the concept:

- Q1: Such apps should be available at welfare centers.
- Q2: Such apps should be used for career guidance at schools.

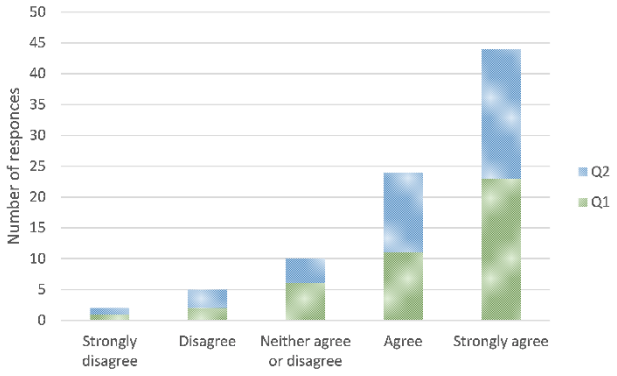

Figure 3: Young job seekers about the concept

5.1.2 Welfare Professionals

This group was also very positive towards the concept, but for different reasons than the job seekers. Job seekers wanted to use the simulations to get information about professions/positions, while welfare professionals believed the main goal of the concept should be training and career-related self-efficacy increase, because self-efficacy "*is essential for everything!*" (welfare professional). Thus, they were optimistic towards using the concept to improve young job seekers' skills with specific work tasks and job interview-skills.

They supported the idea of including the concept into their exiting counseling of young job seekers and claimed that there were many existing programs where Immersive Job Taste and VR-interview training could be incorporated. However, the questionnaire data indicates that there is no unity among the welfare

professionals if integrating such apps into the welfare system will be easy, and half of the respondent answered agree to the question if an additional support system would be needed to exchange experience of using virtual internship apps.

The quantitative data show that the welfare professionals are more positive attitude towards the concept (Fig. 4) than the job seekers.

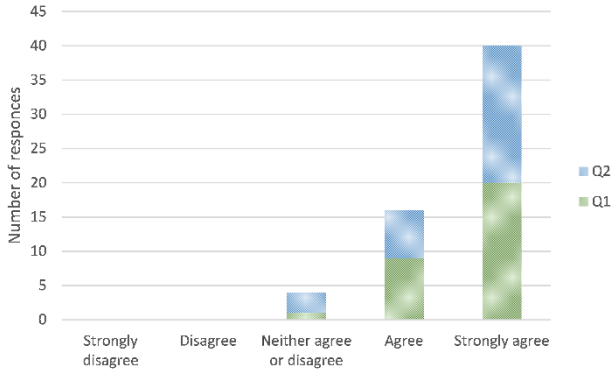

Figure 4: Welfare professionals about the concept

5.2 Challenges for the Job Taste Concept

The participants pointed out some general challenges and limitations to the apps and the Immersive Job Taste concept. Minor drawbacks to the technology include the cost, the potentially large size of room-scale systems, and its relatively early stage of development. The size and cost might be less important issues for the Norwegian Labour and Welfare Administration (compared to individual users), but the job seekers have raised questions to the Administration's competence in handling advanced technology: "*they probably have to call the janitor to help with the VR-headset, that's normal*" (job seeker). The welfare professionals claimed that young job seekers can be trained to handle the apps themselves as assistants.

A larger concern with VR technology is limitations in its simulation ability. Though some participant claimed that the concept can be used to shorten training/introduction programs when starting in a new position, most argued that the simulations will never be able to simulate reality fully: "*However good it gets. You will, for example, with those controllers, never get the finger motoric you need in filleting*" (job seeker).

5.3 Further Development

Welfare professionals were very positive to the inclusion of game mechanics, something they thought was a great way to "meet the youth". The job seekers were divided on the subject. Reward or punishment systems (e.g., points for good performance, no points/progression for poor performance) were met with optimism by some job seekers, who thought it could make the simulation more engaging and motivating and show consequences of actions taken, which again would contribute to realism since "*at a workplace there are consequences for everything you do*" (job seeker). Others were skeptical and claimed that it would make the simulations more of a game for entertainment than a tool for informing and training. Using 'punishments' was also cautioned since they could discourage young job seekers with low self-esteem with thoughts like "*I can't even master the game*". Among the job seekers there was consensus on two questions: First, the option to turn reward systems on or off was considered a good idea. Second, the reasoning behind the reward system should be explicit, so users can learn from their mistakes and improve.

This desire to learn was quite explicit among informants and feedback on performance was widely requested. The users wanted to know when they had done something right or wrong in the simulation and suggested a system as simple as sound or a flashing of light to indicate correct or incorrect execution of task. Another suggestion was to have non-player characters (NPCs) such as colleagues or a boss telling when you did something correctly or incorrectly and explaining to the user how they can improve. The participants also claimed that NPCs would increase authenticity.

6 Discussion and Conclusions

In this paper, we present the concept of Immersive Job Taste and report results of a study that evaluates it. We can confirm our argument that immersive and gaming technologies can help to fill the communication gap between the industries, career counsellors and the young generation by providing an engaging, cost-effective and low-threshold alternative or supplement to internship placements and traditional career guidance.

While 'real-life' internships, visits to companies and using existing career counseling services are an important part of the job-seeking process, they might be time-consuming, logistically difficult and heavily reliant on text-based information. Our participants believe that Immersive Job Taste is a low-cost and time-efficient supplement to these programs, used to both inform and give a certain degree of practical experience.

Moreover, Immersive Job Taste can make the job searching process more motivating, giving the job seeker a more accurate image of a workplace or a position than a text description or an advice from a friend. Information and insight into a profession or position gives certainty in one's ability to make the right career choice. Our participants felt that Immersive Job taste could prevent them from making the wrong career decision and give them a better insight into a profession.

The drawbacks pointed out about the entertaining ability of VR is that it could distract from the main function of the concept – to inform and train users. The participants also warned that VR-simulations could give an unrealistic fun impression of a profession and thus leading to unreliable career choices. Many professions have great variety in everyday work, and if a user interprets the simulation as the standard, it could give an inaccurate image of the profession in general. Due to technical and resource limitations it was impossible to recreate all the aspects of the workplace and implement all the features suggested by the job seekers, welfare professionals and employers such as smell, advanced haptic feedback and interaction with NPCs as well as representation of a broader array of working tasks within a virtual workplace.

We highlight that in order to be able to create new virtual workplaces quickly and efficiently and to provide a consistent user experience, there is a need to further develop the methodology, standards and templates for representing the central aspects of the Immersive Job Taste (captured workplace atmosphere, key information, key competences and tasks, user interface aspects, feedback on performance).

Future work should include a validation of the concept in the actual environments, for example, at unemployment offices and at schools. The personnel need to be trained to use VR or AR equipment and the apps or the apps need to be self-explanatory, with easy installation and minimum required maintenance. A new study is currently being planned to find out how the apps will actually be used for career guidance and ideally whether there will be consequences for employability of job seekers using the apps as well as for recruitment in the corresponding industries.

Another direction for future work is the development a wider variety of workplaces representing several relevant industries, which has been a recurring feedback from the job seekers. At the

same time, not all professions are equally suitable for the concept. From the technological point of view, professions with predominantly manual labour are most suited. Such professions are also the ones most suited for our target group, according to the welfare professionals, i.e. young people with little or no education. We are currently developing prototypes for additional professions: electrician, construction worker and service/hotel worker. Finally, while the major focus of this project was on VR, it would be interesting to explore the potential of AR for the Immersive Job Taste Concept, also in the light of recent advancements in the augmented and mixed reality hardware, such as the launch of Magic Leap and upcoming release of Hololens 2.

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