LINKÖPING UNIVERSITY

TSKS05

ENTREPENEURSHIP - IDEA PM

Beam-formed microphone

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1 Summary

The beam-formed microphone is a product designed to pick up individual talkers in a large audience such as in a lecture hall or a TV-show. It will consist of multiple microphones that can be arranged in multiple ways, for example in an array as depicted in Figure 1. The idea is that when someone in the large audience wants to ask the lecturer a question he can speak right out and the beamformed-mic will pick up this speaker without the need to give him a microphone.

Figure 1: Example of finished product. Figure created with the help of Binksternet's, [1] and Schmalstieg's [2] images.

Our vision is to facilitate communication in large audiences. If an audience can talk seamlessly with the lecturer we believe that we in the least will get better lectures where everyone hears the question or there is no delay to wait for the questioner to get a microphone. In addition, it will be possible to increase the interaction between lecturer and audience, possibly leading to new ways of lecturing. Our long-term goals are to see the beamformer implemented in a large lecture hall at Linköping University and have ongoing discussions about selling it to one large media company. Our main actions to reach the goals are to construct and test the prototype and start discussions with the potential customer.

2   Description

In this section we are going to explain the main concepts of our Idea PM.

Our product is useful in lecture-halls or panels at conventions as well as at TV-shows with live studio audiences, and conference rooms. In short, anywhere a large audience must communicate with someone on stage.

Moreover, our product is a convenient way to record voice content with great quality at a specific point of the room.

In our product we can highlight the following idea; instead of using a phased array like our competitors, our product uses massive audio beamforming – BAM! This gives us the possibility to do more advanced signal processing and pinpoint a speaker more precisely. Our competitors ClearOne can only beamform at certain specified areas from the mic, for example t each chair around a conference table of 10 seats. With our product we can beamform to a specific person wherever in an audience.

There are many benefits to using massive-MIMO. Since there is no need to pass microphones around, it will save time when several people want to i.e. ask questions or comment. There is also less complexity for the organizers or owners of the system, since only one microphone array needs to be installed and tested, leading to lower overall cost and maintenance. The system will almost always lead to an increase in sound quality compared to the audience members shouting out their questions or comments.

There are multiple alternatives to our solution: phased array, wireless microphone and multiple microphones.

The phased array is a product with similar features as our product. A phased array is an implementation similar to our massive-MIMO system and one use of this is a telephone conference. However, our system takes advantage of multipath propagation and uses this to improve the quality of the sound.

Another product that is already implemented and in the market is the wireless microphone. However, the wireless microphone has not got several channels as our product does. Furthermore, you need to move the microphone near the source of the person who is speaking and the condition of the channel needs to be, or normally is, stationary in these applications.

Another alternative is a set of multiple microphones. With this setup you have many different channels to transmit the information from different points in the room. With our system you would only have one static microphone array to get the same features.

The main reason to get our product: Massive audio beam-forming system, this means better quality because we can use multipath effects that are present. For companies with conferences media production, to do online lectures or seminars too. In broadcast system as for example any show-TV with audience.

3 SWOT analysis

Having described the product in detail we will analyze it using the SWOT model (Strength, Weaknesses, Opportunities & Threats). Four dimensions of sustainability will be explored: Technological, Market, Economic and Organizational. Each dimension will be analyzed from the SWOT standpoints and the result presented in a running text.

3.1 Technological sustainability

The beam-formed microphone is a product that is based on solid theory. It is easy to use and to install which lowers the demand on technical knowledge of the users and customers.

The weaknesses at this time is that the prototype is in development, which means that the beam-formed microphone is not yet thoroughly tested. Therefore we are not entirely sure of the sound quality of the finished product.

Our group has an advantage of being the first on the market to put this theory in to practise. The customers will realize the simplicity in using our product and with a simple demo, the advantages of using the beam-formed microphone is very easy to understand.

The complexity of the theory might be a bit frightening for an average Joe. The potential customers might believe that advanced knowledge of technology is required to use the product. The amount of cables and the requirement of a relatively advanced computer connected to the system might give some legitimacy to that claim.

3.2 Market sustainability

The target group of this product is both TV studios and all kinds of lecture halls and conference rooms. The big question is of course, does this product have a good market sustainability?

If nothing drastically happens with the school system, lectures, both online and in class will exist in the nearest 20 years. In that sense this product have a good sustainability in the nearest future. The same goes with TV studios, as

long as they will exist there is a market.

This product is not going to be sold to private persons but rather large companies or universities. The existing group working with this project do not have much experience in marketing and selling products to companies and may loose the competitions due to these factors.

The group creating this product do not know how many similar products there are or are on its way to the market. This can be both a problem or it could also make them work harder in order to achieve a better and more user friendly product.

3.3 Economic sustainability

One great asset we have is our patron that has a burning interest in this product that provides us with both technical and economical support.

However, our patron will not be able to sustain us in the long term. We will need to rely on our product and the willingness of our potential customers to buy the product. By offering this product to big actors on the market that will hopefully buy our product and view it as an investment and retain us as a provider of good complementary audio systems.

If the customers are loyal to our product it means that we can provide them with technical support for a finite set of time. This will give incentive to the customer to at least stay with us for this time. If they want to continue to receive our astonishing technical support, they would have to pay for it and we will continue to give out salaries.

One economic aspect is the cost of the finished product. We must make sure that the cost of the final system is reasonable and makes it attractive to the customers. A weakness here is that since the prototype is not finished we do not have a known cost of it. So far, the prototypes components cost almost 7000 US dollars. To this, the cost of the man-hours to construct the product must be added. The final product however, might not need 64-elements and once constructed cheaper alternatives for certain components can be regarded. One of our competitors, ClearOne sell beam-forming microphones for telephone conferences. Their product can support 10 microphones in a room and is priced at 3000 US dollars.[3] Our product can support more than 10 users, which is an advantage, but triple the amount of users does not justify tripled the price.

3.4 Organizational sustainability

The group is small, so an advanced organization is not needed. However, we must ensure that we are organized in a manner that lets us acquire and utilize the needed resources in an efficient manner. The resources needed is money and competence. Money is needed to get materials for the prototype and pay the group both when assembling the prototype and marketing the product. We also need technical competence to assemble the prototype, as well as marketing and economic competence to sell the product.

One of the strengths is that we have the needed technical competence. The group is also accustomed to working in projects and will work efficiently. However, the group has not received diplomas of their eduction yet. The diplomas would make it easier to convince investors that the group has the needed knowledge and that the theory that is presented is valid.

The primary customers are media and broadcasting companies that install and operate recording solutions. A weakness of the group is that we have no contacts or knowledge of that business area. Through initiatives like Innovationskontoret we believe that it is possible to get guidance and an introduction to needed business areas.

Another weakness is the lack of money. We must find a sponsor willing to invest in the product. Many successful start-ups have started at Linköping University. We believe that studying at LiU gives us an opportunity to find good investors.

4 Action plan

The first and most crucial step in our action plan is to guarantee the technical feasibility of our product. The theoretical feasibility is well established and there exist systems for proof of concept. But for us to commercialize the product we first need to make a working prototype that is in scale and use hardware of the same price as in the later product. Then thorough testing needs to be done.

Regarding market potential we believe the need for our product is already there, i.e. that many potential customers are already aware of the underlying problem we try to solve. However we need to investigate our ability to actually sell our product. This is most easily done by approaching some potential customers and inquire them on an eventual transaction. Only then do we know the preconditions of getting the product out on the market.

The previous step requires some customer relations, which we have to develop

over time. Since we are in a lack of contacts beyond of our university, the first way to head for help is Innovationskontoret.

Apart from that we will make a thorough search for similar products. We know something but not everything about our potential competitors.

The business would have to wait for our current group to finish our masters degrees. This will give us the time needed for business implementation as well as a higher credibility towards customers. In the meantime, we will stay tuned for identifying potential coworkers to extend the team in the future. A candidate would preferably have knowledge of business and marketing or product development.

References

[1] File:Semi-stereo loudspeaker cluster.jpg provided by Binksternet under Creative Commons Attribution-Share Alike 3.0 Unported at: https://commons.wikimedia.org/wiki/File:Semi-stereo_loudspeaker_cluster.jpg

[2] File:LGM 2014, audience.jpg provided by Manuel Schmalstieg under Creative Commons Attribution 3.0 Unported at: https://commons.wikimedia.org/wiki/File:LGM_2014,_audience.jpg

[3] ClearOne Beamforming Microphone Array, https://www.cdw.com/shop/products/ClearOne-Beamforming-Microphone-Array/3038981.aspx?enkwrd=clearone%7cbeamforming%20mic&pfm=srh