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Bixby Capsule to Implement Command based Smart Assistant

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Abstract: ***Bixby Capsules are the way of expanding the knowledge of the Samsung Bixby assistant. The capabilities of Bixby are combined into capsules that developers develop in Bixby studio. Through the working capsules this Projects aims at designing a command-based assistant that can efficiently solve certain actions in specific application. Which will be helpful for the user to get things done easily with help of virtual personal assistant. The assistant typically takes advantage of deep linking to find destination apps. Objectives are Developing Bixby capsules that handles specific intention of user by having model with use cases specific to app. Further developing a Bixby client which acts as a bridge between android service and Bixby server. When our server produces result it has view/dialog for presenting results or prompts after processing.***
The outcome of this project would be a working Capsule that predicts the action to be taken based on the command provided by user and provide the result in the same context. A Capsule with multiple actions to handle different intents by resolving input content with a high accuracy. A GUI that presents the result without changing the context and not showing the popup on currently working view.
Keywords: Bixby Capsule, Intents, Smart personal assistants.

I. INTRODUCTION

Many activities are becoming too easy in this digital world. Most of the work are done without even your physical movement and systems are becoming smart that they assist us in most of the activities, they are called as Smart Personal Assistants (SPA), they work on artificial intelligence and natural language processing. They literally increase your way of living life depending on your usage. Even in the workspace they will actually increase productivity and safety on adoption to developing tasks. Recent study says that these assistants are becoming part of their life. Some of the SPAs are Samsung Bixby, Google assistant, Alexa by Amazon, Microsoft Cortona etc. They are improving day by day in performance and quality of analysis through users' input. The worldwide number of SPA users is expected to grow from 390 million in 2015 to 1.8 billion in 2021 which will result in a total revenue increase from $1.6 billion to $15.8 billion [2]. Thereby, SPA is capable of operating simple task to operating all smart home devices
The assistant typically takes advantage of deep linking to find destination apps. To make your app a potential destination app, consider adding deep linking support. The matching between the current user context and deep links or other potential actions displayed in the overlay window is specific to the assistant's implementation. Bixby is a smart personal assistant developed and used by Samsung company in all its products it operates efficiently in order to get users work done. Its memory can be expanded by the normal developers through the coding conventions given by Samsung in the developer section. Bixby capsules can be developed through Bixby studio with the languages namely Bixby language and JavaScript. A capsule will have actions of user intention when he invokes particular action with input data that particular action will be performed to produce result in view and dialog format.
The final system is expected to satisfy all the requirements mentioned here. Functional requirements are:

A. The model should be able to resolve the input to specific use case along with output expected by the user when he invokes assistant. As prediction is one of the most important functionalities in the requirements, specified, the model must achieve this.
B. The Application should be able to collect input from the various kinds of views in android. As this will eliminate human effort required to copy the contents.
C. The model should be able to analyze the sentence and return the expected result. With usage its accuracy should increase.
D. The result for the command issued will be displayed on the screen without changing the current context. This functionality should aim at the user not getting irritated when result appears.

Non-functional requirements refer to the attributes that represent quality of a system. The various common non-functional attributes are Speed, Scalability, Reliability, Usability and Responsiveness etc.
The non-functional requirements for this system are as follows:

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1) The model's accuracy should be high enough to be commercially viable. If the accuracy is low, then it won't add any business value to the company.
2) The model should reduce the number of false positives and false negatives to prevent any incident from being sent to the wrong team. If an incident is not sent to the right team, then it involves double the work to reroute it to the right team which requires human intervention. In such cases, the model is redundant and it would have been better to have classified the incident manually rather than using a model.

II. LITERATURE SURVEY

This section details some of the smart personal assistant features and analyse them for implementation, this would help to improve implementation of this project. Wayne Wobcke, Anh Nguyen, Van Hai Ho and Alfred Krzywicki in "The What and How of Smart Personal Assistants" discusses about the way of checking the calendar and email evants through assistant in a PDA device. With the single user interface and multiple tasks at the backend to perform analysis. Users should feel easy to select the domain on which he wants to check easily. The system is implements with the help of coordinator called BDI which coordinates the actions and assisting the tasks and final dialog will be encoded. It will result in high level of abstraction and plans which are independent of domain [1].
Robin Knote, Andreas Janson, Matthias Söllner and Jan Marco Laumeister in "Classifying Smart Personal Assistants: An Empirical Cluster Analysis'' discusses about the how this digital era will actually reduce the complexity present in our lives. As such, Alexa from Amazon and Siri from Apple with the utility of personalized and situation-dependent information and service provision. However, it is difficult do research on Assistants as they are becoming very complex to analyse. Systematic literature review used to compare those assistants even with the complexity, a cluster analysis reveals five SPA archetypes: Adaptive Voice (Vision) Assistants, Chatbot Assistants, Embodied Virtual Assistants, Passive Pervasive Assistants, and Natural Conversation Assistants [2].
Rasika Anerao, Utkarsh Mehta, Sharangdhar Vaze and G. Hrishikesh in "Personal Assistant to Facilitate User Task Automation'' discusses about the minimization of iput devices in the usage of assistant while using Personal computer. Voice commands will be really user friendly. This paper also describes how results should be presented and different assistants available in the market. And discusses on usability of the model [3]. Robert S. Cooper,Jeff F. McElroy and Walter Rolandi in "Personal virtual assistant" Discusses about the behaviour of the virtual assistant and how that can be changed by the user, Discusses about how information can be effectively retrieved from the natural language speech, even through communication network, when computer running remotely and study on how response delay occurs with different server[4].
Pooja Jain in "Bixby, Digital Voice Assistant in Samsung Phones" Discusses about the Latest available smart assistants, why they have still limited role in everyday life. With various examples as why, they actually use those assistants. But Bixby uses a different strategy in assistant such that it attracts most of the people around world and how Samsung continue to be in best assistant technology among other assistants. [5]. J. Liu and J. Yu, "Research on Development of Android Applications," discuss on the strategy to develop any kind of android application. Gives details on the framework to fallowed by developers. To give example they have demonstrated it through a music player and explained how the component of android application works. They gave guidance to understand the operation mechanism of app development in android platform [8].
Abhinav kathurai in "Challenges in Android Application Development: A Case Study" discusses on the effect of smart phone usage that brings change in the human life and day to day activities. How android os has become the most widly accepted and lot of developers started working on it to grow. It is open source and anyone can access it freely. They developed an app on online quiz that will really help learners and students to prepare for the competitive exams like NEET, GATE etc. [9].

III.METHEDOLOGY

Fig 1 depicts the conceptual flow of Bixby capsule development. Bixby Capsule development follows below sequence:

A. Actions are the specific operations that Bixby perform when user provides the input to the Capsule through natural language utterance.
B. Concepts are also called inputs are values to be used when performing the action. These inputs are internally converted to intents and provided to the capsule to perform analysis.
C. Training is very important step as each action should get to know possible inputs in the user sentences which will not be in standard format. So, possible utterances need to be trained for mapping actions to sentences.
D. Endpoints are bridge between Bixby language and Java script language as JavaScript will have actual code that perform operation which needs input data for its functions to operate. Those inputs are provided through Endpoints in Bixby studio.

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E. Dialogs and Views are the way of presenting the predicted output to the users which follows Bixby language syntax during implementation. Views are text display of result on the screen and Dialogs used to present result through voice.

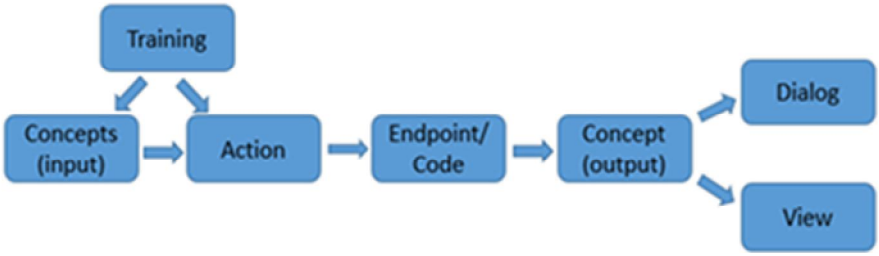

Fig 1 Conceptual flow of Bixby capsule

The Methodology of Assistant development along with Capsule is divided into three phases as follows:

1) Android services

a) To bring output to user intention of work specific to app tasks, which internally interacts with Bixby capsule Service and other services offered by Samsung.

b) Bixby server will carry out all analytics and processing and returns result to called service.

2) Bixby client support

a) Create a receiver in Bixby client to accept commands from Android service.

b) Analyse data flow when user issues a command specific to use case.

c) Interact with server to predict the result.

3) Bixby Capsule Development

a) Develop suitable flow of data from input to specific android service

b) Training Capsule with various sentence formats

c) Implementing suitable punch out mode to launch the result window

d) Handling capsule for all use cases.

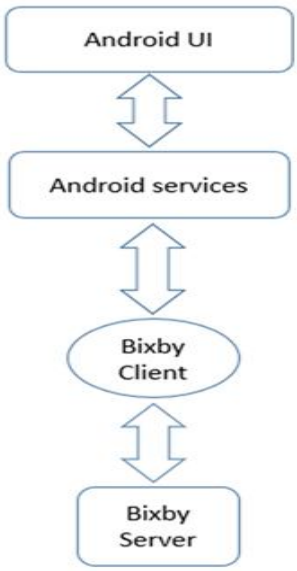

Fig 2 Modules in the Command based assistant project.

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IV. RESULTS

The result would be a working Capsule that predicts the action to be taken based on the command provided by user and provide the result in the same context. The outcome of this project could be achieved by following the methodology and achieving the objectives in the described order.

A. *The Major Outcomes Of This Project Are*

1) A Capsule with multiple actions to handle different intents by resolving input content with a high accuracy.
2) The result for the command issued will be displayed on the screen without changing the current context.

B. *The Outcomes And Results Of The Objectives Set*

1) Successfully developed Capsule with multiple action classes that accepts input from Bixby client and interacts with Bixby server to predict the result after resolving the intent content.
2) Bixby client can collect sentence from specific applications by checking view actions asynchronously and deliver the input to Capsule.
3) After getting back the result from Bixby server, client initiates intent to present the out through free form development.
4) The result popups and users doesn't have to wait until the result comes and can carry on his work until he finishes current task, or he can ignore popup if doesn't require now.
5) Complete history of command issued will be temporarily stored, he can check that any time to reissue the command.

V. CONCLUSIONS

Developing Bixby Capsules will really helpful in predicting any actions that user wants. From this tool project was initiated by keeping in the mind that manual approach has some limitations to accomplish tasks in the same context. These limitations were translated into new requirements and a new project. "Command Based Assistant" was designed and implemented, so as to overcome the limitations faced by the existing manual approach Command based Assistant is better version than manual approach. Hence, this would help the company users in saving time and memory power.

VI. LIMITATIONS

Although using the Command based Assistant approach will give a better performance than the existing manual approach, which includes the features of automation in resolving the intents, it will definitely have certain limitations.
No model can accurately resolve the input sentence to obtain inputs for the prediction and specific action to perform among all use cases.
Users of the product should be good at issuing the correct command hence only those who have good typing skill can easily use the product rest prefer to go for UI based selection that can be implemented in the improved version

VII. ACKNOWLEDGMENT

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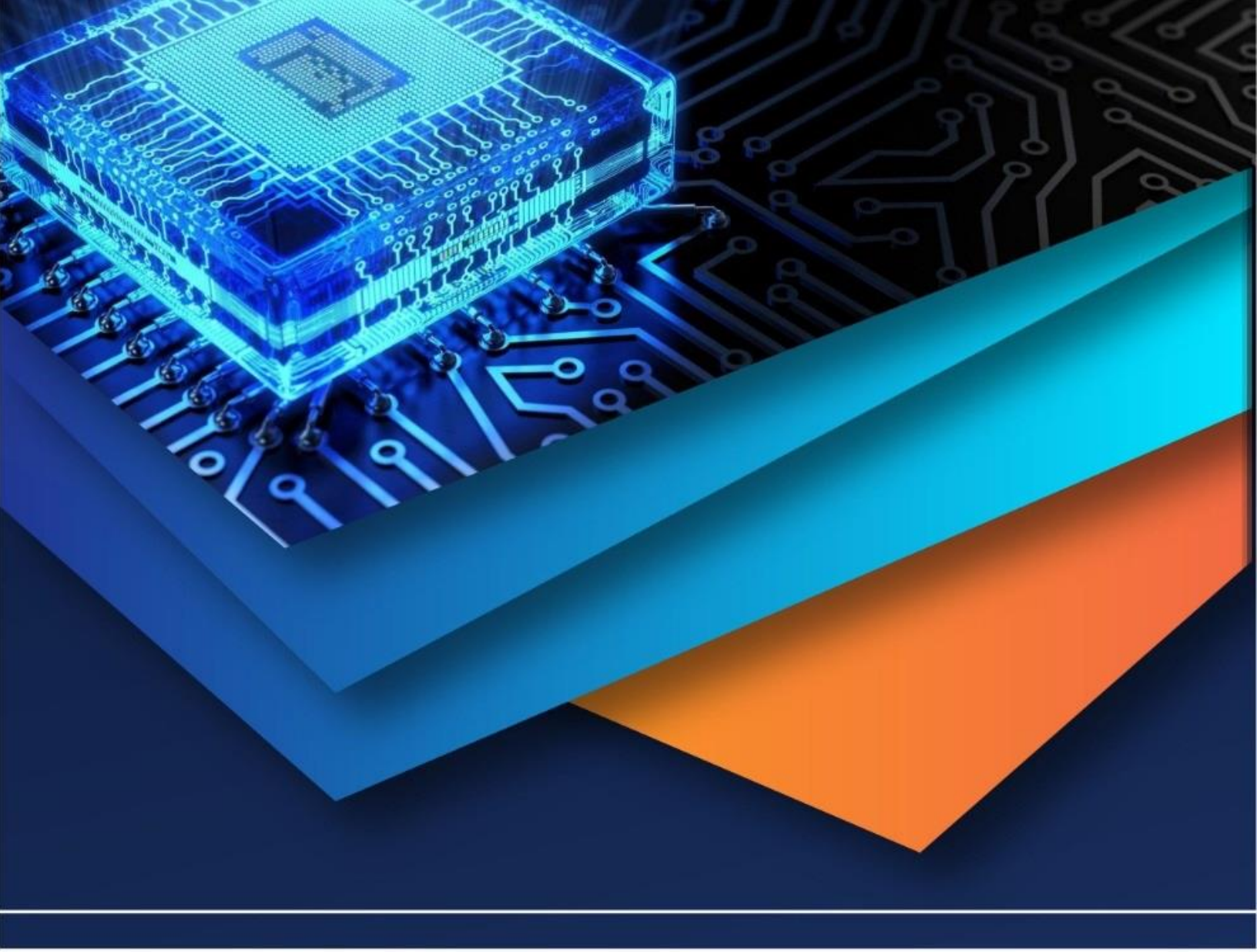

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