

A SUPPORT MODULE FOR THE VIRTUAL PATIENT EDUCATIONAL PLATFORM

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ALMAS



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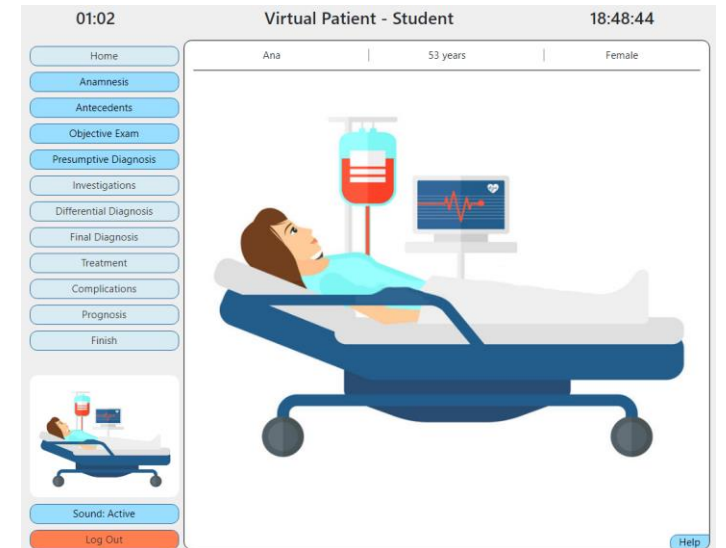
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Introduction

- As a result of the lack of access to hospitals for medical students during the COVID-19 pandemics, a web-based platform is being developed in partnership between the Carol Davila University of Medicine and Pharmacy in Bucharest and the University Politehnica of Bucharest.
- The platform allows students to reproduce their interactions with their patients, that usually take place in hospitals, through an virtual avatar.
- It also allows teachers to evaluate and score each session of each student.
- After the evaluation of the platform by multiple groups of students, the need of a support system that supports students during the evaluation process was identified (instead of the support that was provided through email or Skype).
- Therefore, a support system was developed.
- The support system was developed as independent system and was integrated as a module in the platform.

Platform Description

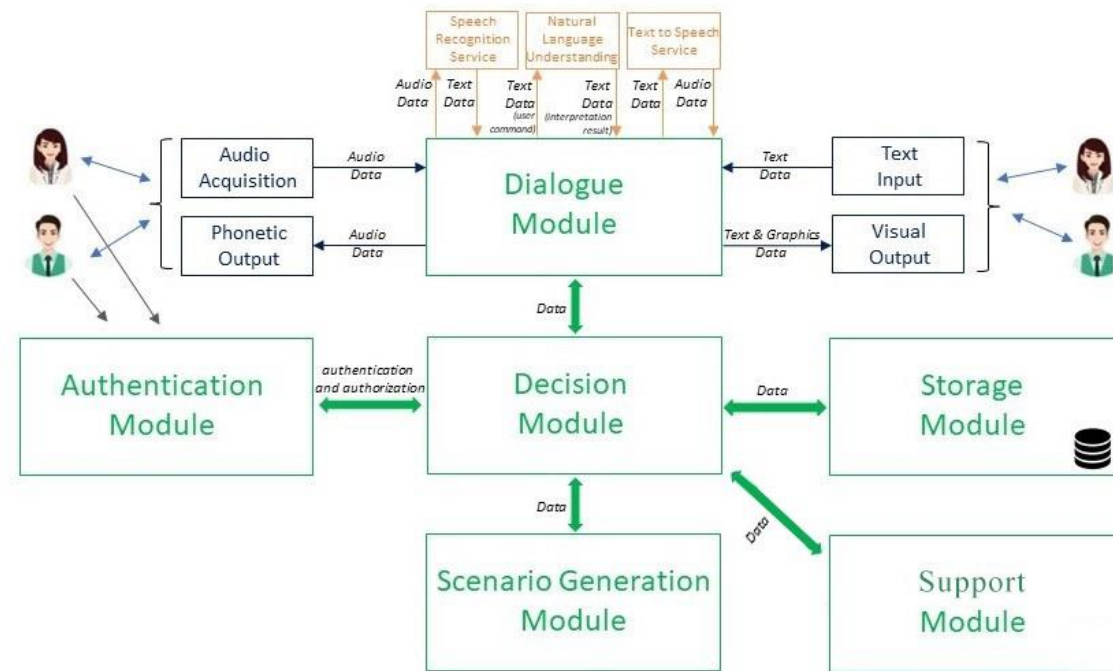
- The platform allows medical students to reproduce virtually the consultation and diagnosis processes they usually carry out in hospitals with their patients.
- In clinically valid scenarios, medical students can interact with virtual patients through text and speech interactions to perform the anamnesis phase.
- Students can access the health records of a patient (including the health history of the patient) and to perform an objective exam.
- They can ask and investigate different health investigations (such as: ultrasounds, computer tomography, electrocardiogram, radiography, blood analysis).
- Students must elaborate a treatment plan and should provide presumptive, final and differential diagnoses as well as a description of the complications that may appear during the evolution of the disease or during the treatment.
- Furthermore, the platform allows professors to evaluate and score the sessions of their students (in real-time or afterwards).
- The platform has three types of users: students, teachers and administrators.



First page of a scenario (student view).

Platform Architecture

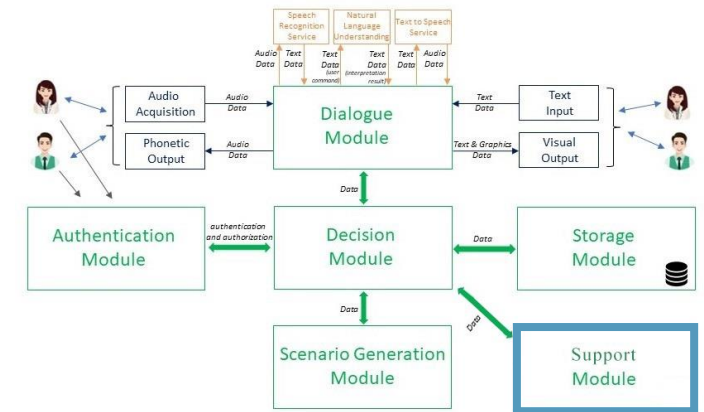
- The platform has a modular, microservice-based architecture.
- It is formed of six modules:
 1. authentication module,
 2. decision module,
 3. scenario generation module,
 4. storage module,
 5. dialogue module,
 6. support module.



Platform architecture.

Platform Architecture – Support Module (1)

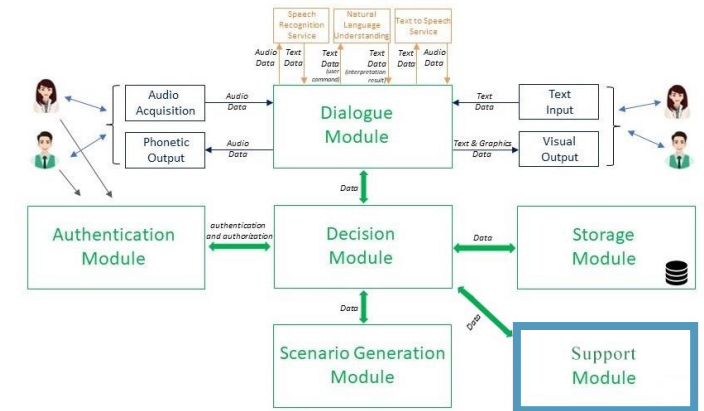
- By implementing robotic process automation, the classic support process got improved:
 - the tasks of the support management process are handled in an automated way,
 - a chatbot offers support to users in the same manner that a human being would.
- Before the implementation of the robotic process automation of the support management process a case of study was elaborated to determine the:
 - different aspects that will be covered by the support module,
 - best way of communication with the different modules of the platform,
 - expected problems which users may address the support module to solve,
 - best option that should be used to integrate the support module into the platform.
- The support module accepts only text interactions with the user, however it is envisaged to enable speech interactions in the future.



Platform architecture.

Platform Architecture – Support Module (2)

- When users need help or support, they should press on the Help button that can be found in the lower right corner of the screen.
- Once the help button is clicked, a pop-up chat widget appears.
- In order to obtain help from the assistant bot, users can:
 - introduce a question or a text that is describing the issue that they are facing,
 - choose from a pre-defined list of questions/topics.
- The assistant bot will provide text answers to questions and in some cases, it will ask users if they prefer to watch a video about the situation they are asking about.
- In the case in which the situation is not resolved, the chatbot will automatically put the user in contact with a person from the support team.



Platform architecture.

Evaluation (1)

- After the integration of the support module, a group of 14 medical students from University of Medicine and Pharmacy "Carol Davila" Bucharest tested the platform at their domicile using the google chrome browser on a computer.
- The students have not participated in any of the previous evaluation of the platform.
- During the evaluation, each student accessed the platform 16 times scenarios that covered symptoms associated to a specific heart disease from the following (4 times for each):
 - pulmonary thromboembolism,
 - acute coronary syndromes,
 - moderate or severe mitral regurgitation,
 - severe aortic stenosis.
- When students needed any assistance/help, they used the support module that assisted them. After each session, each student was required to fill an online questionnaire to provide feedback about the session.

Evaluation (2)

Table I. Platform usefulness evaluation results.

	Very Useful	Useful	Neutral	Not Useful
Number of Students	11	2	1	-

Table II. Support module usefulness evaluation results.

	Very Useful	Useful	Neutral	N/A (not used)
Number of Students	12	-	1	1

Table III. Recommendation.

	Extension of supported diseases	Extension of anamnesis questions	Extension of support module	Enhancement of support module
Number of Students	14	12	14	11

Table IV. Student satisfaction.

Disease	Number of Students			
	Highly Satisfied	Satisfied	Neither Satisfied nor Dissatisfied	Dissatisfied
Pulmonary Thromboembolism	13	1	-	-
Acute Coronary Syndromes	8	3	2	1
Moderate or Severe Mitral Regurgitation	9	4	1	-
Severe Aortic Stenosis	4	7	2	1
Module Support	4	8	1	N/A (not used) 1

- As illustrated in Table 1, 78% of medical students that evaluated the platform found the platform very useful (the majority), 15% found it useful while 7% were neutral about its usefulness.
- As illustrated in Table 2, 86% of students found the support module very useful while 7% were neutral about its usefulness. 7% of students have not used the support module.
- As illustrated in Table 3, 100% of students recommended the extension of the diseases that are supported by the platform and the extension of the support module in order to cover more aspects, 86% of students recommended the extension of the supported questions during the anamnesis phase while 79% recommended the module enhancement.
- As illustrated in Table 4, 61% of medical students were highly satisfied regarding the performance of the platform, 27% were satisfied, 9% were neither satisfied nor dissatisfied while 3% were dissatisfied.

Evaluation (3)

- During the evaluation, the support module answered the question that were addressed by students.

Table V. Some of the questions that were addressed by students.

Question Group	Question
missing question	Why is the patient not answering my question?
	Why does the patient answer "I am sorry I did not understand. Please repeat your request"?
	Why does the patient not answer all the questions during anamnesis?
disabled section	Why am I not receiving a correct answer?
	Why does nothing happen when I click on investigations?
	Why can't I click on the investigation button?
	Why can't I access the investigations section?
missing investigation	Why does nothing happen when I click on treatment?
	Why are some sections disabled?
	Why am I not receiving the coronary angiogram?
same scenario	Why am I not receiving all the requested investigations?
	Why am I receiving the same scenario?
	Why am I receiving the same case after I log in?
speech related	Why do the scenario not change?
	Why can't I click on speak?
	Why is the patient not listening to me?
can't log out	Why is my microphone not working?
	Why can't I log out?
	Why is the log out button disabled?
	Why does the log out not working?

- Compared to evaluations where the support module was not available, the support module improved the assistance process on the platform by making it easier for the medical students, faster and more efficient.

Conclusions

- Virtual patients are capable to allow medical students to replicate their interactions with patients that typically occur in hospitals.
- They allow medical students to acquire essential skills and experience in the practice of patient consultation and diagnosis.
- The integration of a support module enhanced the assistance process on the platform and made it easier and more efficient.

Future Work

- As future work:
 - The extension of the support module in order to assist teachers as well.
 - The enhancement of the support module by enabling speech interactions between the user and assistant bot and improving the accuracy of the provided answers.
 - The extension of the diseases covered by the platform.
 - The extension of the supported questions during the anamnesis phase.

Acknowledgements

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Thank you!



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