An Automated Interviewing System (AIS) to support the Human Resource Management

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Abstract

In order to discover candidates who would work well with the current team and stay around for the long run, employment interviews seek out enough information from applicants to assess their technical talents and skills, personalities, and behavioural patterns. Naturally, candidates will represent themselves in the best possible light, making it difficult to get below the surface and find the real issues. Any type of interview can use the following three elements to help interpret a candidate: personality, performance types, and facial micro-expressions. The interviewer can direct the interview questions and learn about the candidate's personality to determine if the applicant's personality will be a good fit for the job and the team. Determine whether the candidate will be satisfied with the position in the long term by looking at the candidate's performance patterns. Verbal and non-verbal communication takes place during the interview.

Keywords: Automated Interview System (AIS), Facial expression, voice detection, lie factor, Voice Stress Detection, verbal and nonverbal communication.

Introduction

Conducting a computer-based interview is a precious technique in seeking the information from an interviewee. The tools also improve interpersonal communication capabilities[1]. Artificial intelligence (AI) technology vastly provide self-decisions making techniques and systems for the organizations to seek most suitable candidates and to decide scheduling[2-4]. The proposed system is based on two modules first module is based on nonverbal communication in which the system considers the upper part of face from nose to forehead to check the facial expressions which assist in checking confidence level of candidates and second module is based on verbal communication in which system check the knowledge of the candidate in related area.

In conventional experience, an interviewer focuses to verify knowledge, confidence and gestures to judge any candidate. Such features are necessary to implement in automated interviewing system. Despite the verbal communication, an automated interview based system is the system is proposed to interview using the non-verbal communication. Therefore, the important technique of system is required to ensure the similarity features between the verbal and non-verbal messages and gestures. In case there is no resemblances, then it would be clear the candidate is most probably answering a lie and the non-verbal gestures are always more believable over words. A person can be deceptive using words, but it is not easy to hide gestures when lying. The body language cues can be misleading and are not easy to comprehend. It might also be challenging to implement how accurately the system read a candidate's body language during an interview. System acquires abilities through experience and practice which enable it to modify their nonverbal behavior.

Factors Affecting the Nonverbal Communication: The non-verbal communication can be carried using gestures which is more believable than words. Body language, speech pattern and facial gestures are good example of non-verbal behaviours. It is not easy to hide gestures while communication. The similarity between the verbal and non-verbal communication is important. In case it is not found the system meant to say that candidate is answering wrong or lie. Body language is not always accurately communicable. Humans use different non-verbal behaviours during communication. The effective technique to analyse sincerity and openness is palm display. An honest individual will always show open arms gesture while discussion or communication. While the person telling lie use to hide the palms at behind or putting hands in pockets or folding the arms. Besides, rubbing the hands reveal the pleasant anticipations, the speed of rubbing experience about expected good results.

Another tactic to know the negative response is hiding lips while speaking. The hand makes this movement when the mind tells it to stop dishonestly speaking words. Sometimes, the fake cough is used in combination with the mouth guard gesture. Nasal rubbing may involve gentle strokes under the nose. It is usually used by women.

This move is used in conjunction with a mouth guard gesture. Generally, when lying, liars avoid looking at the other person's face. Men usually rub their eyes angrily to avoid staring at the other person. Some observations suggest that a person usually scratches about five times. It is rare that a person scratches more or less. These signs indicate doubt and uncertainty. This can be helpful in lie detection. A liar uses it when lying and suspects that he has been caught. This gesture help the interviewer ask questions, such as "Could you repeat what you said, please?" which may cause the cheater to give.

A very easy way to detect lies is when head gestures contradict verbal messages. Nodding is widely used head movement. A nod means "yes", or an affirmation, while a nod means "no", or a negation. For example, a person who nods his head and says, "Yes, I understand your point," is most likely lying. It is also true that irregular rapid breathing and a series of short breaths followed by long deep breaths usually indicate cheating. The stress of lying often leads to a dry mouth, resulting in frequent throat clearing and hoarseness. The most common signs of liying are the deceptive in lower body parts especially between legs and feet. The mind has the least control over them. Foot shuffling, toes wriggling, and crossing and crossing of legs are signs of someone being a cheater.

Facial micro expressions reveal true feelings they are hard to recognize. Only professional interviewers can see them during a conversation. People uncover themselves by adjusting their behavior when lie. There are perceptible micro terminologies that move across the face rapidly within a second. Fewest of these are contraction of muscular twitches, pupils, flushed cheeks. Individuals hide their facial emotions by suppressing expressions. Some signs of suppressed facial expressions are narrow eyes, tightened jaw muscles and a tense forehead. People try to make others feel positive by making a fake smile. Fake smiles are easily distinguished from a real. A genuine smile gives feet wrinkles, movement from facial muscles and pushed up cheeks. The real smile gradually evolves and fades. But fake is confined to the lower half of the face.

Speech is a form of verbal communication. Lies are predictable from speech patterns, voice tones and their mismatch with words being said. A deceiver speaks in an inexpressive voice and liars try to have a higher pitched voice than truthful individuals. Liars try to speak in muddled way full with speech mistakes. Mostly they make sentence change, sentence repetition, and sentence incompletion mistakes. A speech sentences of deceiver sounds like questions showing that one is seeking reassurance. The verbal communication is exchange of verbal statements with the other peoples using any specific language understood by both. Persons in an organization use verbal communication that employs understood spoken words, with tone, accent, with which the words are expressed.

People who speak truth frequently use the "I" pronoun to reveal actions. They used to minimize self-references. Describing events in passive voice is a good way to minimize references. Candid people mostly describe historical events in the past tense, while, deceptive individuals refer to events as occurring in the present. Using events in present tense recommends that people are rehearsing events in mind. Interviewer should pay attention to points in a narrative at which the speaker shifts to inappropriate present tense usage.

People try to avoid interviewer's questions by filling statements with expressions of uncertainty, and vague expressions. Vague uncertainty expressions allow deceptive person to change statements. Truthful assertions mostly contain related details some may not be relevant to the question asked.

It happens due to true assertions are retrieving things from long-term memory. Mean length of utterance is the average number of words called per sentence. It equals the overall words of a statement divided by the number of sentences:
Total no. of words / Total no. of sentences = MLU
When people feel nervous about an event they speak longer or shorter sentences. Investigators should pay particular attention to sentences whose length differs significantly from the subject's MLU.

Background Study

James Shea et al. 2018 found that computing technology based interviewing system can cause a non-verbal interviewee behavior, which detect deception using an automatic system. Authors demonstrated that candidate deception risk scores from non-verbal behaviour taken during an interview, which conducted by an Avatar. The interviewing system is based on an artificial neural networks configuration, used to extract non-verbal behaviour and sense facial objects in the form of micro gestures within a short time period. Authors, conducted a set of empirical experiments based on a typical airport scenario of security over a packing suitcase matter. Dataset of 30 participants being interviewed by a computer based Avatar collected detecting either truthful or deceptive scenarios[5].

Iftekhar et al.[6] presented a computerized-automated system for assessing verbal and nonverbal behaviors of interviewee. The system evaluates different traits of facial expressions including smiles, head gestures, facial tracking points. It analyse language features of word counts, topic modeling, and detect prosodic information of pitch, intonation, and pauses.

The system predicts the ratings for interview traits such as friendliness and excitement[6]. Non-verbal communication such as facial expressions and body language rather than facial micro-expressions help the interviewer understand the candidate's reactions. Non-verbal communication features eye contact, facial expressions, posture and hand gestures are taken into account by most recruiters. Eye contact ensures that the interviewer is serious, engaged, assured and responsive.

Hence, recruiters advise to keep it constant throughout the interview process. Failure to do so will result in fearful and false individual appearances. Interviewees who are trying too hard or acting dishonestly are more likely to be detected by the interviewer unless they are instructed and spend too much time. Acting on these feedbacks. Key points include sitting up straight without slouching or having a commanding posture, both of which reflect the interviewer's confidence, can play a vital role throughout the interview process.

Suleyman et al.[7] recommended that facial micro-expressions are common set of emotions which provide cohesion to interpersonal communication. He further analysed the changes made in micro-expressions are seen to be the most important in the context of emotion. In this research, a deep learning model interprets the data of variations appeared in the face into information. The information is trained using dataset of Facial Expression Recognition. Authors obtained the required data via live video stream through computer vision detection and evaluating it with trained model. The final data obtained is interpreted to determine deceive status.

These investigations led to the inclusion of facial micro-expression assessment as one of the assessment techniques used throughout the interview process. Recognizing that facial expressions, along with other behaviors such as body language and tone of voice, must be read in the context of the moment. Many of the facial expressions that an anxious person often displays, such as clenched jaw, rapid blinking, and lip licking, are highly recognizable to us. Micro-facial expressions, which can be complex and last less than a second, are difficult to see and understand without much practice and commitment. These small changes in the lips, eyes, and eyebrows, which often express surprise, are examples of facial micro-expressions.

Necessity of Automated Interview System

As the great growth of industry, many companies are seeking for more and more employees. Not only an ordinary and less skilled employee, but well trained and fit best at their position at industry. A good employee recruiting strategy is the best way to avoid having recruiting turn into a time-draining activity. It's an uncomfortable situation for every recruiter, they are searching for the right candidate for a great job and suddenly they have hundreds of Resumes on their table.

Facial expressions play a significant role in human dialogue. Our system will give them ease while finding the right candidate for the selected Job. The questions are designed in such a way that a candidate can answer clearly. By using this system, candidate cannot be able to deceive the interviewer. The main objective of this work is to provide a simple, detailed, and comprehensive enough to meet the real needs of automated interview system in terms of facial expressions, loudness/ pitch, and speech.

Smart Recruiter (Lie Detector System): The second phase of our project involves interviews of users who have applied for jobs through our portal and then the major feature of our project is the lie detector, now this feature works with live video streaming of interviews. Yes, the video will perform. A lie detector will look at the facial expressions of the interviewee and display it on the desktop system, whether the interviewee is lying about something or not. The concept of Smart Recruiter refers to a smart and intelligent recruitment that will be done by conducting an interview and using a video lie detector that will broadcast the video live throughout the interview. The judge will be the interviewer and the result will be updating on the desktop system that will be displayed the results of this lie measurement of the user.

A lie detector system will only catch micro-expressions though facial expressions and then display a visual notification on the system whether the person is telling the truth or not. Basically, a lie detector measures these types of results by looking at a person's expressions. A lie detector test will measure false results by certain factors including holding your nose and covering your mouth with your hands and not making eye contact with the interviewer.

The lie detector system in Smart Recruiter with the concept of lie detector refers to a smart and intelligent recruitment by conducting an interview and demonstrating the lie detector performance through a video which is live-streaming the video throughout the interview will broadcast live. The judge will be the interviewer and the result will be updated on the desktop system which will show the result of measuring the user's lie. Eye movement is most important in lie detection tests, when a person is being interviewed the interviewer cannot look the interviewee directly in the eye. The person's eye must make contact with a camera in the system that will recognize facial expressions and gestures.

Features of Application (Lie Detector): When there is a lie detector test, during the test, the video streaming will be shown on the system where the lie detector system will be implemented and through this video, we can tell the test taker whether he is lying or not. No. When the interview is conducted, there will be a system in front of the person whose camera will capture the entire interview and show the results by implementing a lie detector system.

When the interview is in progress and immediately the person lies about something, our lie detector will detect the lie and display a quick notification or alert message on the system that the person answered as a lie was given. The main factor through which the lie detector system will work is through facial expressions, by capturing the interviewer's facial expressions and through this the lie detector test will perform its functionality.

Another important factor through which the lie detector system will work is to put starch in the nose and cover the mouth with the hands. This feature will be its key point. A lie detector test to accurately complete and practice the test. Measuring the interviewer's gestures is another part of the lie detector system, all of these facial expressions are included in the interviewer's movement cues, and by measuring these gestures the lie detector test can be performed accurately. Micro- expressions are a key feature of lie detection systems that typically focus on the brow bones and eyebrow curves. To test the candidates, the interviewer should look at the system while answering the questions, as the lie detector system will work with the video capture by the camera on the system and this camera will detect the lies of the candidates. Another important factor by which a lie detector system will work and perform tasks is through eye movements. Capturing and examining the eye movements of the interviewer and thereby the lie detector. The test will perform its function and can measure whether the person is lying or not.
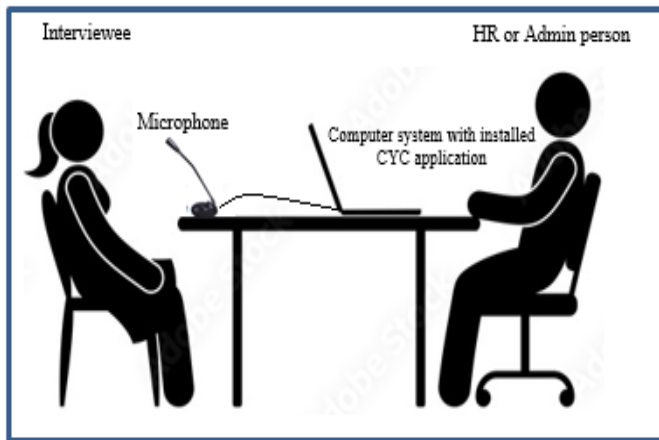

Figure-1: Conceptual Model.

Check your Confidence (CYC) Module: Testing confidence is a basic requirement of many organizations and every organization wants to recruit a confident employee like teachers, assistants and telephone operators. If an organization wants to recruit a person in a higher position, trust should be ensured before appointing such employees. The system will check confidence test to solve the problem of organizations in recruiting confident employees. A conceptual model is a set of concepts, used to assist employees to understand, or visualize the subject matter that the model represents. The physical model like a toy model represents the function of the toy. The conceptual model is used to discuss models that are created after simplifying the conceptual process. Such models represent attributes in the real world.

The conceptual model is an important part of system development life cycle. If the conceptual model is not fully established. If the system qualities are incorrectly implemented poor system performance will be faced, or it will lead to hurdles in future. Such failures are related to lack of customer input, vague and changing requirements.

These relations can lead to incorrect implementation of model objectives. The systemic failures are controlled by observing the development of the complete system to improve development objectives or techniques.

Figure-2: Proposed working Model.

Results and discussion

The system will check confidence test to solve the problem of organizations in recruiting confident employees. The interviewer can direct the interview questions and learn about the candidate's personality to determine if the applicant's personality will be a good fit for the job and the team. System determines whether the candidate will be satisfied with the position in the long term by looking at the candidate's performance patterns. Ensuring trust is key element of an organization for recruiting a person, trust should be ensured before appointing such employees. The conceptual model is used to assist employees to understand, or visualize the subject matter that the model represents. The conceptual model is used to discuss models that are created after simplifying the conceptual process. Such models represent attributes in the real world. The lie detector test, will be shown in video streaming on the system whether candidate is lying or not.

Conclusion

Automatic interviewing is a new concept in recruitment process. The organization determine candidate personality and satisfaction and to discover suitable individuals who would work well with the current team and stay around for the long run of the organization.

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Employers conduct interviews to seek out enough information from applicants to assess their technical talents and skills, personalities, and behavioural patterns. The proposed research present a model based study to visualize the recruitment process to detect personality traits using lie detector test to make recruitment process transparent and real to the best placement of the candidates.

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