Design of an Emotion Elicitation Framework for Arabic Speakers

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Abstract. The automatic detection of human affective states has been of great interest lately for its applications not only in the field of Human-Computer Interaction, but also for its applications in physiological, neurobiological and sociological studies. Several standardized techniques to elicit emotions have been used, with emotion eliciting movie clips being the most popular. To date, there are only four studies that have been carried out to validate emotional movie clips using three different languages (English, French, Spanish) and cultures (French, Italian, British / American). The context of language and culture is an underexplored area in affective computing. Considering cultural and language differences between Western and Arab countries, it is possible that some of the validated clips, even when dubbed, will not achieve similar results. Given the unique and conservative cultures of the Arab countries, a standardized and validated framework for affect studies is needed in order to be comparable with current studies of different cultures and languages. In this paper, we describe a framework and its prerequisites for eliciting emotions that could be used for affect studies on an Arab population. We present some aspects of Arab culture values that might affect the selection and acceptance of emotion eliciting video clips. Methods for rating and validating Arab emotional clips are presented to derive at a list of clips that could be used in the proposed emotion elicitation framework. A pilot study was conducted to evaluate a basic version of our framework, which showed great potential to succeed in eliciting emotions.

Keywords: Emotion elicitation framework, Arabic emotion data collection, emotional movie clips.

1   Introduction

Emotions have been widely investigated lately for their importance not only to psychology, neurobiology and sociology, but also for affective computing studies. Affective computing is the study of automatic detection of human emotional states, which has seen much interest lately for its multidisciplinary applications. For example, Human-Computer-Interaction (HCI) is concerned with enhancing the interactions between users and computers by improving the computer's understanding of the user's needs, which includes understanding the user's affective state [1]. In the education field, understanding the emotional state of a student could lead to a more effective presentation style [2]. A current interest in the personalization of commercial products could be enhanced by understanding the client preference based on their mood [3]. Moreover, such understanding of the user's emotions could enhance other applications such as virtual reality and smart surveillance [4]. Such automatic recognition of emotions could also be useful to support psychological studies; for example, to give a baseline of the emotional response of healthy subjects, which could be compared to and used to diagnose mental disorders such as depression [5] or neurodevelopmental disorders such as autism [6].

To study emotions in an efficient, reliable and replicable way, a standardized laboratory setting is needed to induce emotional responses. Studies of emotions in the literature can be divided into simple, discrete, and dimensional emotion representations. Simple emotion representations investigate and compare only positive and negative emotions. Discrete emotion representations use a finite number of distinct classes, such as Ekman's basic universal emotions which are *anger*, *disgust*, *fear*, *happiness*, *sadness*, and *surprise* [7]. In dimensional emotion representations, emotions are represented as points in continuous space along multiple dimensions such as valence / pleasantness and arousal / intensity.

Standardized techniques to elicit emotions, such as reading self-referent statements, listening to music, watching film clips, recalling autobiographical information, or combinations of these, have been surveyed in [8]. In addition to these, other techniques have been used, such as odors, emotional imagery, facial expression, and social interactions [9, 10]. Emotion eliciting film clips are widely used in affective studies [11, 12] for their great advantages compared to other techniques, which include the standardization ability, deception reduction, dynamical property, ecological validity, and results replicability [13]. In addition, movie clips proved to induce discrete emotions and could (with the correct method of evaluation) induce dimensional emotions [10]. A limitation, however, of using emotion eliciting film clips is that the selected clips have to be validated to induce the emotions in question. To date, four studies have been conducted to validate movie clips in three different languages and cultures. In [14], a first collection of 12 English-speaking films was shown to elicit six emotional states. Subsequently, [13] presented a collection of 16 English-speaking films that elicited eight different emotional states. Another study validated 70 French speaking movie clips collected from different cultural backgrounds (French, Italian, British and American) [10]. Recently, validated Spanish dubbed clips with the capacity to induce emotions were presented in [9].

Knowing that cultures have a great influence on emotions and their triggers, the same set of elicitation clips could produce different results for different cultures. In [15], it has been concluded that emotional practice (expression and interpretation) of an emotion drastically differs between cultures. Also in [16], the author discussed the cultural influence on emotional responses, concluding that the differences between cultures lie in eliciting certain emotions. The author supports his conclusion with an example of differences between the reactions of northern and southern Americans to the same emotion eliciting stimuli [16]. Considering cultural differences and language between Western countries and Arab countries, it is possible that some of the validated clips, even when dubbed, will not elicit similar responses. Moreover, dubbing might cause subtle differences that could distort the emotion evaluation and some of the clips may not be culturally acceptable by the Arab community. Therefore, there is a need to select and evaluate a set of emotion elicitin clips that are suitable for Arabic speakers in affect studies on an Arab population.

To the best of our knowledge, studies of affect in the Arab world are scarce. Given the unique and conservative culture, a standardized and validated framework for future studies is needed in order to be comparable with current studies of different cultures and languages. In this paper, we describe a framework and its prerequisites for eliciting emotions that could be used for studies of affect on an Arab population. We present some aspects of Arab culture values that might affect the selection and acceptance of emotion eliciting video clips. Then, in line with previous studies, we display validation methods for the selected clips. We present a pilot study conducted in Saudi Arabia to share some observations and to demonstrate the effectiveness of a basic framework.

2   Framework Prerequisites

For the framework to succeed, two preparation steps have to be performed first. Since the main component of our proposed emotion elicitation framework is movie clips, these clips have to be carefully selected and validated to prove their effectiveness in inducing the emotions in question. Figure 1 summarizes the stages for our proposed framework.

2.1   Selecting and Rating Emotional Clips

As mentioned in Section 1, only three previous studies have been conducted to select and rate emotional clips. In [13], 494 participants were divided into 31 groups to group-view 10 clips (different for each group) from a total of 78 that were refined from 250 clips selected by colleagues and film critics to induce eight emotions (anger, fear, sadness, disgust, surprise, amusement, contentment, or natural). After each film, subjects were asked to fill an emotion self-reporting questionnaire [13]. Similarly in [9], 127 Spanish subjects individually watched 10 clips of carefully selected subsets of 57 films to induce seven emotions (anger, fear, sadness, disgust, amusement, tenderness, or natural). A self-report questionnaire
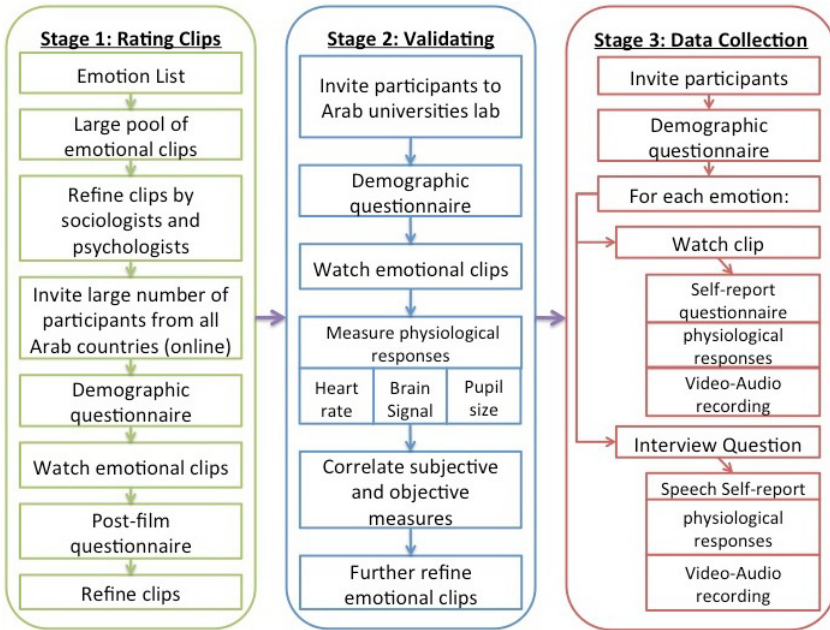
Fig. 1. Proposed framework and its prerequisites

of dimensional and categorical representations was completed by each subject immediately after watching each clip [9]. For the list of French clips [10], 70 clips were selected from 824 clips by 50 movie experts to measure seven emotions as in [17]. The refined clips were divided to sets of 10 films each, then were viewed by 364 participants, assigned to 7 groups. Emotions were measured by several self-report questionnaires: a 7-point scale of emotional arousal, a differential emotions scale, and a positive and negative affect schedule [10]. In our proposed framework, in line with previous studies, a standardized list of emotions to be induced in Arab population includes anger, fear, sadness, disgust, amusement, surprise, and natural.

The Arab countries in the Middle East and North Africa have unique and conservative cultures, Saudi Arabia being the most conservative one, which makes clip selection criteria tricky. Even though most Arab cultures share the same language and religion, they are diverse for reasons such as history, foreign colonisation, and revolutions [18]. Most of the general characteristics and values in Arab cultures are based on the Islamic religion, emphasising respect for all religions and prophets, honoring and obeying the parents, and following and complying to Islamic religion rules [19]. Arab cultures share general characteristics and values, such as a tribal structure, and honor, chivalry and courage values to defend their tribe and allied tribes, especially protecting women whether or not they are related to them [19, 20]. Not surprisingly, these cultural values have influenced and restricted the media to reflect on Arab population expectation and acceptance [21].

Even though Western media is popular in Arab countries, content undergoes a thoughtful censorship [22] or adjustments [23]. For example, in [13], a clip to elicit happiness, using Jesus' name as fun material, is not accepted in Arab cultures due to a respect for religions and prophets. Another clip in [13] to elicit amusement shows sexual references, which is strictly unacceptable to the Arab community and media. Another important aspect of Arabic clip selection is the huge gender difference in expressing emotions between men and women due to the cultural expectations of both genders [19, 24]. For example, a clip showing a woman being flirted with will induce fear in Arab female viewers, but rage in Arab male viewers, due to valuing honor in Arab cultures [19, 24]. As a consequence, clips that could lead to different responses based on the viewer's gender should be avoided.

Due to the complexity and variability of Arab cultures, social experts and psychologists should review and refine a pool of emotion inducing clips suitable for Arab cultures. Beside cultural selection criteria, a few other criteria should be considered. First, the clips should be relatively short in duration and at the same time should induce emotions without additional background explanation. Second, each clip should induce a specific emotion from the identified list of emotions in question. Cinema and theater production in Arab countries are limited, which increases the quality and number of television production, including television series [22]. Particularly, Arab television drama score the highest viewing rate at 99.7%, followed by religious shows, and news [22]. Although using television series adds the difficulty of finding a short clip without additional background to induce a specific emotion, the high quality and popularity of such series might overcome this issue. Moreover, editing such clips to include minimal background would be sufficient to elicit emotions.

Once a sufficiently large pool of video clips has been selected, a rating scheme of the emotional effect of each video clip should be run on a random and dispersed Arab population. Following previous studies, the clips will be assigned to subset groups, where each subset should contain at least one clip to elicit each emotion. A post-viewing questionnaire should be completed after each clip, covering dimensional and categorical emotions as in [9, 10]. The clip subsets should then be viewed by subjects of different Arab countries and cultures, in gender balanced and age matched groups. Given the large number of Arab countries and the sparse distance between them, the internet could be used to facilitate the rating of the selected clips. Although using the internet is convenient for participants to rate the clips from home in their spare time, the variability in the subjects' mood as well as the variability in continuity (pauses) while watching the clips might affect the rating. Knowing that controlling environment settings could be compromised using the online rating, this step should be done only to rate the selected clips for further validation. In order to reduce outliers and variability caused by the lack of control, the number of participants should be large enough to mitigate this issue. Subjects could be invited with arrangements and collaborations with universities from each country. Before participating, invited subjects should electronically sign a consent form and also fill a demographic

questionnaire asking about their age, country, cultural heritage, physical and mental health, etc.

2.2   Validation of Selected Clips

Given the diversity of Arab cultures and the online method proposed to rate the clips, objective emotional response measures of top rated clips are necessary not only to validate the rating, but also to further refine the top rated emotional clips. Once a top rated clips list has been selected, validating this list should be conducted to measure the correlation of self-reported results with their physiological reaction. Most of the emotion eliciting clips in previous studies relied only on the self-report, subjective measures, mentioning the importance of objective validity of their clip selection [9, 10, 13]. Only in [17], the selected emotional clips in [9] were validated by measuring physiological responses using the skin conductance level and heart rate, where a convergence between subjective and objective responses was found.

An extensive literature review on physiological activities in emotion using several cardiovascular, respiratory, and electrodermal measures summarized the effectiveness of such measures as an indication of emotional activities [25]. With the use of current technologies, brain signals, heart rate, skin temperature, and eye activities could be measured in a normal university lab setting. We propose the use of portable multi-channel electroencephalogram (EEG) devices to measure brain signals, the use of skin conductance devices to measure sweat, heart, and respiratory rate, beside blood pressure, and the use of an eye tracking device to measure eye activity and pupil size. The top rated clips from the first stage could be shown to invited participants in a lab setting individually or in groups to measure the physiological activity. Although showing clips to participants in groups could speed up the validation, multiple physiological measure devices might not be available. Another advantage of the group setting is that it might simulate real-word emotion expression; however, in such exploratory studies comparably expressing emotions might be preferred in an individual setting. Based on the objective validation of the emotional clips using physiological measures, a final emotional clips list will be selected. With these physiologically refined clips, a standardized list of Arabic emotion elicitation clips will be produced, which can be used for emotional data collection.

3   Emotion Elicitation Framework Design

Our proposed framework contains induced emotions by emotional clips and spontaneous emotions elicited by asking affective questions in an interview. By this stage, a list of Arabic emotion elicitation clips will be validated and standardized, which will be used as one of the main components of our proposed framework. After each emotion eliciting video clip, a question will be asked designed to arouse that particular emotion. Our proposed framework is described in the following subsections and summarized in Figure 1.

3.1   Participants

To collect a large and rich Arab emotional database, participants selection should cover cultures, genders, ages and socio-economic levels. As mentioned earlier, collaborations with most Arabic universities might cover the diversity of Arab cultures. Ideally, a gender balanced participant cohort would be beneficial for emotional differences between genders. Covering age groups, where participants will be divided into three groups (e.g. $< 25, 30 - 45, > 50$), will be beneficial to psychology and sociology studies to study the effect of age in the physiological and behaviour measures. Finally, having a balance of at least two socio-economic level groups will be constructive to study the sociology differences in affect.

3.2   Recording Environment

Although non-standardized recording environment is more easily accessible, the variability from such environment is challenging and might affect the results. Therefore, a standardized recording environment and settings is preferable in such exploratory studies. Ideally, a highly controlled recording environment would be desirable to get high quality and clean recording. However, finding such recording environment for all locations of Arabic universities might not be feasible. Therefore, a reasonably quiet room with good lighting might be sufficient. Using semi-structured interviews to elicit spontaneous emotions (see Section 3.4) requires an individual recording setting for participants.

3.3   Hardware

Since the database in this framework is intended to be large and rich for multidisciplinary studies, both physiological measures and audio-video emotion expressions will be collected. We propose the use of portable multi-channel electroencephalogram (EEG) devices to measure brain signals, skin conductance devices to measure sweat, heart, and respiratory rate, beside blood pressure, and the use of an eye tracking device to measure eye activity and pupil size. In addition, audio-video recordings of participants' facial and vocal emotional expressions will be made for further affect analysis.

3.4   Protocol

Demographics: Before participating, invited subjects must sign a consent form and also complete a demographic questionnaire. The demographic questionnaire will cover general personal questions such as age, country, and cultural heritage, and general health questions about physical and mental health conditions. Questions about general personality characteristics as well as the subject's economic and social situation, will be useful to rationalize results. The aim for such a questionnaire is to have a wide understanding of differences or similarities in emotional responses.

Watching Movie Clips: The validated clips from the second stage are deemed to elicit the selected emotions. Participants will watch one clip per emotion, starting with a neutral clip to normalize their affect. After watching each clip, participants will be asked to complete a short post-film questionnaire to self-report the intensity of each emotion they felt.

Interview: To induce spontaneous emotions, emotion eliciting questions about events that aroused specific emotions in the subject's life will be asked after watching each clip. That is, after watching the amusement clip, a question about a happy moment in subject's life will be asked. Although it might not be convenient to interview the subjects after each clip, this method is beneficial as each clip will the prepare subject's mood for that particular emotion.

4   Challenges and Opportunities

The large number of Arab countries, the sparse distances between them and the diversity of cultures within each country will introduce several challenges as well as opportunities. Opportunities for collaboration with universities spanning the varied cultures of the Arab world call for careful coordination and planning. Rules and regulations vary in different countries, which need to be taken into consideration when implementating the proposed framework to allow for sufficient time for the study to be carried out in different contexts. For example, video recording females on Saudi Arabia's university campuses is restricted [26], a collaboration with other institutions (e.g. hospitals, private organizations or companies) could overcome this issue. A restricted confidentiality and ethics agreement for such data collection will strengthen the acceptance of this type of research within the Arab population (both males and females) to participate.
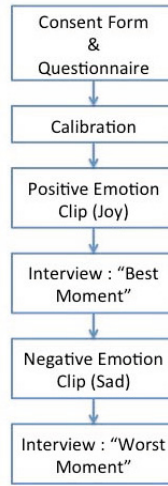
5   A Pilot Study

A proof-of-concept version of the framework was designed to elicit positive and negative emotions only using two video clips and two interview questions. The paradigm and initial results are desribed in the following.

5.1   Emotion Elicitation Paradigm

Given the unique culture of Saudi Arabia, and to ensure acceptance of all participants, video clips demonstrating positive (joy) and negative (sad) emotions were selected from classic cartoon animation series dubbed in Arabic, namely: "Heidi" and "Nobody's Boy: Remi", respectively. The clips had an almost similar duration ($\sim 2.5min$). Participants were asked to rate the emotional effect of each clip and whether they have seen the clip before, as that could affect their response. The positive emotion clip had a positive affect rate of 8.27 out of 10, with 10 being the highest positive effect. 57% of the participants had seen the clip before. The negative emotion clip had a negative affect for 6.43 out of 10

Fig. 2. Emotion elicitation paradigm and data collection process for the pilot study

participants, with 10 being the highest negative effect. 7% of the participants had seen the clip before.

Apart from inducing emotions, watching video clips served as a preparation of the participant's affect for the spontaneous emotion elicitation via a semi-structured interview, where participants were interviewed about an emotional event in their life. That is, after watching the positive emotion clip, the participants were asked about the happiest moment in their life. For the negative emotion, after watching the negative emotion clip, participants were asked about the saddest moment in their life. The paradigm of our data collection is shown in Figure 2.

For emotion eliciting clips, self-report was carried out by rating the clips and answering questions about their feelings after watching the clips. For the interview questions, we assume that the questions elicit the emotions, although the answers were not validated for certain emotions. We also physiologically measured emotion elicitation using an eye tracker (see Section 5.3).

5.2   Participants

In this experiment, 71 native Arabic speakers were recruited from a convenience sample (65 females, 6 males). The age ranged from 18 to 41 years ($\mu = 25.6, \sigma = 4.8$). Regular participants' mood and mental state are important for the study. None of the participants reported any mental health disorder (no clinical validation). 72% of the participants reported they were in their normal, neutral mood at the time of recording, 7% always sad, and 22% always happy.

5.3   Recording Environment Settings

We used a Tobii X120 eye tracker attached to a Toshiba Satellite L655 laptop. We used a PowerLite 1880 XGA Epson projector screen as an extended monitor

to the laptop to ensure that the participants look at similar coordinates while watching the clips and while talking to the interviewer. While the participants watch the clips, the interviewer leaves the room to reduce distractions and to allow the participant to freely watch the clips. The interviewer enters the room for the interview questions and locates themselves in front of the projector screen. The screen resolution and distance from the projector screen and the eye tracker location were fixed in all sessions. Although we had limited control of light in the recording room, we normalized the extracted features for each segment of each participant to reduce the light variability coming from the video clips themselves and the room light.

5.4   Initial Findings and Observations

Due to ethic restrictions at King Saud University regarding video recordings of participants, observations were made only by the interviewer at the time of the interview and were not recorded. Regarding negative emotions, while watching the clip, 39% of participants rated the clip to have a strong effect (more than 8 out of 10), though only almost 1% cried over the clip. On the other hand, while answering the negative emotion interview question, 70% of the participants cried (including one male participant). Since the negative clip shows a death scene, almost 85% participants talked about their negative emotion during losing a loved person in their life. Other topics included injustice, failure and conflict with a close person. Those late findings indicate that watching the video clips prepared the participant mood for the spontaneous emotions in the interview. Since the number of male participants was not enough to make any reliable gender comparisons, more data needs to be collected.

For the positive emotion, while watching the movie clip, 53% of participants rated the clip to have a strong effect (more than 8 out of 10). In contrast, while answering the positive emotion interview question, only 0.7% of the participants cried while expressing their joy (none of which were males). Our observations indicate that unlike happiness crying, sadness crying was associated with eye contact avoidance. Pupil size measurements indicated dilation activities during emotion expression, with more activity in the spontaneous emotion expression. However, for a reliable conclusion, more participants need to be recorded.

In our work [27], we only analysed eye activities as an indication of the emotional state. In general, the automatic classification results using eye activity were reasonable, giving 66% correct recognition rate on average. With more channels to be included (facial expression, voice analysis, physiological cues, etc.), we anticipate a higher recognition rate. Moreover, while expressing spontaneous emotions, the recognition rate of positive and negative emotions is slightly higher than for induced emotions. This finding indicates that spontaneous emotions might have stronger eye activity patterns than induced emotions. Statistical measures show statistically significant differences in eye activity patterns between positive and negative emotions. We found that pupil dilation size and duration increase while expressing negative emotions. We also found less eye contact due to head rotation. In our previous work [28], we investigated fixation

features and found significant differences in fixation duration and count between positive and negative stimuli.

Given that these initial observations and findings are based on a basic version of our overall framework, which only investigated positive and negative emotion elicitation, we anticipate a great potential for our framework to succeed.

6 Conclusions

In this paper, we presented a standardized and validated framework for future studies of emotions that is needed for the unique and conservative Arab cultures. Such framework is important in order to be comparable with current studies in Western cultures and languages. We describe a framework and its prerequisites for eliciting emotions that could be used for affect studies on an Arab population. We present some aspects of Arab cultural values that might affect the selection and acceptance of emotion elicitation video clips. Two main prerequisites must be performed before collecting emotional data using the proposed framework: rating and then validating Arabic emotion eliciting clips. The validation scheme will finalize a list of clips that will elicit emotions to be used in our proposed emotional elicitation framework. Our suggested framework contains both in-duced emotions by emotion eliciting clips and spontaneous emotions induced by answering affective questions in an interview. After watching each video clip, a question will be asked arousing that particular emotion. We also conducted a pilot study in Saudi Arabia to test the feasibility and effectiveness of our frame-work on a small scale. Our initial findings and observations are encouraging as they showed the successful elicitation of emotions.

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