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An Innovative Exploration of Psychological Research Methods Driven by Artificial Intelligence: A Case Study Using Facial Expression Technique to Improve Teenagers' Self Awareness

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Abstract: Incorporating artificial intelligence (AI) into psychological research can significantly advance AI methodologies and concurrently address inherent biases and inaccuracies in traditional psychological research reliant on manual data collection and analysis. This study introduces an innovative fusion of traditional facial expression recognition, a method aimed at alleviating the self-awareness of teenager students, with contemporary AI facial recognition technology. Through the integrated facial expression recognition system, the project aims to motivate students to identify their emotion, subsequently enhancing their psychological well-being and alleviating self-care.

Keywords: Psychology; Teenagers; Artificial intelligence; Self-awareness, Facial expression, Emotion.

1. Introduction

Psychology studies the principles of human behavior and psychological activity. Ever since the dawn of humanity, attention has been given to understanding human psychology and behavior [1]. Psychology employs scientific methods to analyze these behaviors with the primary methods including observation, surveys (which can be broken down into questionnaires and interviews), testing, and empirical methods. However, these traditional methods present certain challenges: they can be influenced by the motivation or bias of both the researcher and the subject, leading to potential deviations or inaccurate results. Additionally, gathering large-scale data in a short time frame can be difficult due to resource constraints with large cost of resources. These challenges can limit the potential advancement of psychology.

Currently, artificial intelligence (AI) is an expanding field of research and innovation. As AI technology matures and finds its way into various applications, it also brings a new dimension to psychological research. By addressing the shortcomings of traditional methods, AI fosters growth and innovation in the realm of psychology.

2. Demand Analysis

Professor Ackerman, a renowned psychologist and educator, has significantly contributed to the research on micro-expressions. He once posited, "Maintaining a facial expression can induce genuine emotions," particularly in studies focused on smiles. Supporting this, a 2020 study in the journal "Experimental Psychology" by the University of South Australia showed that facial muscle movements could trick the brain into feeling the emotion associated with that expression, such as happiness from a smile [2]. The "Happy Face Treatment" refers to a therapeutic approach grounded in the principle of the facial feedback hypothesis, which posits that facial expressions can influence emotional experiences and cognitive processes. Originating from Darwin's assertion that emotional expression can enhance the felt emotion, this treatment modality capitalizes on the idea that intentional manipulation of facial musculature can induce or amplify specific emotional states. Research has consistently demonstrated that the physical act of smiling can elicit positive feelings and potentially serve as an adjunctive intervention in mood regulation strategies[3]. The question then arises: can this therapy alleviate emotion-awareness in teenagers?

To explore the efficacy of "smiley face therapy" on adolescents' susceptibility to learning fatigue using conventional methodologies, several challenges emerge. Primarily, the accurate capture of spontaneous smiles in this demographic necessitates specialized equipment and expertise. Moreover, involving students can inadvertently introduce biases, as their engagement with an unfamiliar tool or the presence of an external evaluator might alter their natural reactions, potentially skewing data acquisition. Manual assessment or rating of these smiles can also be influenced by the evaluator's cognitive and emotional state, introducing potential discrepancies. Furthermore, the process of gathering this data over an extended semester duration is both labor-intensive and time-consuming, adding complexity to the data management aspect.

In contrast, Artificial Intelligence (AI) offers a more objective approach to analyze facial expressions. AI can quantify smiles by calculating nuances in facial muscle activity and expressive alterations. For example, during a smile, there are discernible changes in facial features: the corners of the eyes may crinkle, there might be a subtle squint in the eyes, and the mouth's corners may elevate, revealing teeth. AI can consistently and accurately recognize and evaluate these markers, offering an objective determination of whether an individual is smiling.

Therefore, this paper introduces a smile scoring and classification system based on AI. By integrating AI, a simple button press can capture students' smiles, automatically score them based on their genuineness, superimposing this score on the photo, and classify and store them using facial recognition. As students operate the system themselves, the data is more reflective of their natural state. With AI ensuring consistent

scoring standards unaffected by external factors like weather or mood, and automatic classification, the process becomes more efficient. This efficiency allows psychologists to concentrate on result interpretation rather than manual processes.

3. A Brief Introduction to The Smiley Face Scoring and Classification System

The "Smiley Face Scoring and Classification System" is a real-time video capture tool equipped with a camera, designed to save photographs portraying the smiling expressions of young students at the simple press of a button. This system is fundamentally structured around four key components: human-computer interface, systematic data acquisition, data categorization, and the critical feature of smiley face detection. The design and operational architecture of the system are detailed in the accompanying Figure 1.

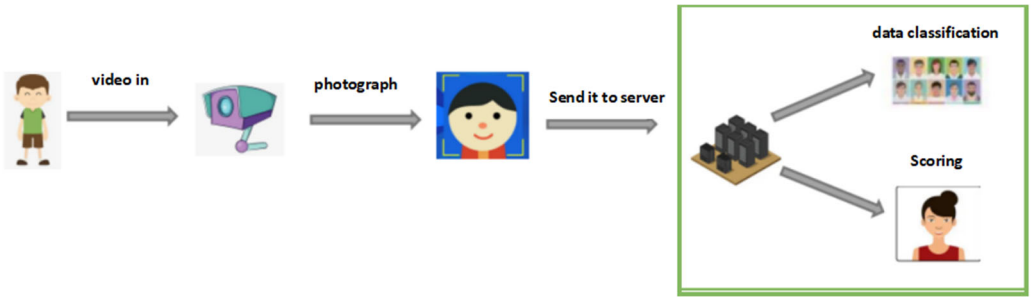

Figure 1. System framework schematics

Within the system, the data collection component utilizes the camera to capture real-time video and photographs. These collected data are then sent to the computer. The smiley face recognition component evaluates the smile's intensity and assigns a happiness score ranging from 0 to 100, precise up to two decimal points. The data classification component leverages facial recognition and comparison technology to categorize the photos. As a result, every student has a dedicated folder to store their captured smiling faces.

This system is programmed in the Python language. Fig. 2 provides a snapshot of a segment of the project's programming.

```python
import os.path
import sys
import hashlib
import time

import numpy as np
from PyQt5 import QtWidgets, QtGui, QtCore
import cv2
from keras.engine.saving import load_model
from keras_preprocessing.image import img_to_array
from PIL import Image, ImageDraw, ImageFont


class MainWindows(QtWidgets.QWidget):
    def __init__(self):
        super().__init__()
        self.EMOTIONS = ["生气", "厌恶", "害怕", "开心", "悲伤", "惊讶", "正常"]
        self.detection_model_path = 'module/haarcascade_frontalface_default.xml'  # 人脸检测模型
        self.emotion_model_path = 'module/mini_XCEPTION.102-0.66.hdf5'
        self.face_detection = cv2.CascadeClassifier('module/haarcascade_frontalface_default.xml')
        self.emotion_classifier = load_model('module/mini_XCEPTION.102-0.66.hdf5', compile=False)
        self.shows = None
        self.showImage = None
        self.pix = None
        self.txt = None
        self.id = None
        self.txt_asin = None
        self.__main_layout = None  # 总布局
        self.__video_layout = None  # 视频展示布局
        self.__button_layout = None  # 按键总布局
        self.video_qlabel = None  # 视频框
```

Figure 2. An excerpt of the written program

For the human-computer interaction, the project incorporates the graphical interface development library, PyQt5 Kuda. An accompanying figure (Fig. 3) showcases the interface, where real-time video is displayed at the top, complemented by a button below for capturing the smile. The system utilizes a cascade classifier to load an .xml classifier file, which can be based on either Haar or LBP feature classifiers. The system performs face detection across multiple scale spaces, returning the if-detected face region's coordinates [4]. If a face is detected, the system proceeds to evaluate and score the smile, with the resulting score displayed at the bottom left of the captured image.

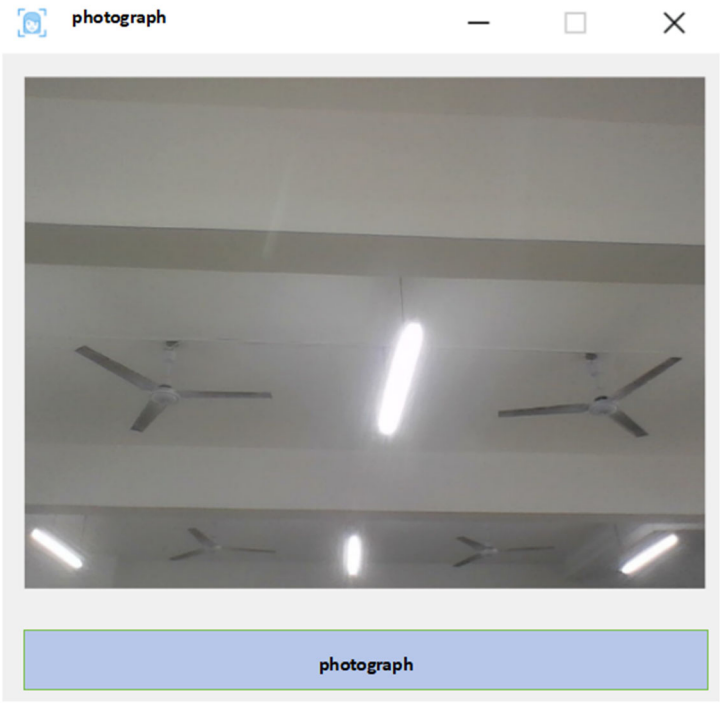

Figure 3. The system interface

4. Analysis and Comparison

Two separate experiments were conducted in different classrooms. One utilized the traditional psychological research method to investigate the efficacy of " happy face treatment, while the other incorporated artificial intelligence by installing a smile recognition system in the class for the same purpose.

Over a span of four months, various metrics were observed: the students' test scores, classroom enthusiasm, and the number of inter-class conflicts. These were analyzed bimonthly. The data demonstrated a consistent rise in both students' enthusiasm and overall scores each month, with the most marked improvements seen in the initial two months. Concurrently, there was a slight reduction in student conflicts between classes every month. From this data, one can infer the positive impact of happy face treatment for improving teenagers' mental health with emotion awareness

The subsequent Table 1 presents a comparison between traditional psychological research methods and those enhanced with artificial intelligence.

Table 1. Data comparison table

	Students' enthusiasm	Number of student conflicts	Students' scores	Labor cost	Sample accuracy
Traditional method	+17.31%	-5.23%	+0.22%	15,380 RMB	94.1%
AI method	+17.83%	-6.02%	+0.23%	9,768 RMB	99.8%

In comparing the two experimental methods, the efficiency and accuracy of samples derived from the AI-enhanced experiment surpassed those of the traditional method. Additionally, the labor costs were significantly reduced with AI. In the AI-enhanced approach, students could instantly view their smiling images and determine their smile intensity through AI scoring. This instant feedback encouraged more frequent smiles and fostered self-awareness. Consequently, the AI-driven method was demonstrably more effective in enhancing the morale of learning-weary students. It's clear that artificial intelligence optimizes experimental efficiency, sample accuracy, and overall effect, all while reducing costs.

Lastly, a survey was administered to the student participants about their experiences during the experiments. Here's a selection of anonymized feedback:

Traditional method feedback:

Student A: It's the same as going to the photo studio, but the difference is that every day someone comes to take photos of me, and I don't know if the pictures look good.

Student B: I don't usually take pictures, but now a stranger comes to take pictures of me regularly with the camera every day. I need pictures of me smiling taken and I have to smile for a long time in front of the camera, which is a little bit embarrassing.

Student C: I didn't get used to it at first, but then I got acquainted with the photographer and felt at ease a little bit. At first, it is very unnatural to laugh every time, but it is not so difficult once it becomes a routine later.

AI-enhanced method feedback:

Student D: It's amazing. I click on the button to take a picture every day, and it also shows my happy score. It's fun.

Student E: It's very different from what I imagined to be taking part in a psychological experiment. Without the

slightest feeling of incompatibility.

Student F: I have developed a habit of smiling with a machine every day. I would laugh a few more times before I decided on a best laugh. After each performance, we even competed with other students to see who has the highest score, and it is very interesting to spot the person with the highest score in today's class.

The feedback highlights a greater acceptance and satisfaction level among students in the AI-driven experiments, revealing the benefits and convenience of AI in psychological research for both the experimenters and the participants.

5. Conclusion

This paper introduced an innovative, artificial intelligence-driven approach to psychological research, using the study of happy face treatment as a prime example. As technology advancements unfold, their impacts reverberates throughout various industries.

With the swift advancement of artificial intelligence, the methods employed in psychological research are evolving. There's a pressing need to actively explore new methodologies within the AI landscape to stay abreast with modern developments. Concurrently, strides in psychological research further enhance AI technology. The symbiotic relationship between artificial intelligence and psychology suggests a future of mutual growth and harmonious evolution [5].

References

[1] Yang Yufang, Sun Jianmin. The discipline system and methodology of psychology and its development trend [J]. Journal of the Chinese Academy of Sciences, 2011 Journal 26 (6): 611-619. DOI:10.3969/j.issn.1000-3045.2011.06.001

[2] Marmolejo-Ramos F, Murata A, Sasaki K, Yamada Y, Ikeda A, Hinojosa JA, Watanabe K, Parzuchowski M, Tirado C, Ospina R. Your Face and Moves Seem Happier When I Smile. Exp Psychol. 2020 Jan;67(1):14-22. doi: 10.1027/1618-3169/a000470. Epub 2020 May 11. PMID: 32394814.

[3] Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: a nonobtrusive test of the facial feedback hypothesis. Journal of personality and social psychology, 54(5), 768.

[4] Ye Tingyun. Python+opencv implements image face detection and video face detection. [EB/OL]. (2022-1-24) https://blog.csdn.net/fyfugoyfa/article/details / 108153075

[5] China Social Sciences Network-China Social Sciences Daily. Wei Si's oracle. Artificial Intelligence helps Psychological Research in the Information Age [EB/OL].(2022-2-18).Https://baijiahao.baidu.com/s?id=1725063426738529880&wfr=spider&for=pc