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Artificial Intelligence Project Practice Based on K210

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Abstract. Under the background of "New Engineering Course", aiming at the difficulty and lack of project resources in the practice course of "Introduction to Artificial Intelligence", the project design of practice course of Introduction to Artificial Intelligence based on K210 chip is proposed. Based on Python language, practical projects are designed with K210 chip to be applied to the introductory course of Artificial Intelligence. The results show that the students' final grades are improved and their interest and enthusiasm are increased through practical courses. The design of AI practical course based on K210 can provide reference for this course and other interdisciplinary introductory courses.

Keywords. Artificial intelligence, practical course, project design, K210 chip

1. Introduction

Artificial Intelligence technology is also a key development direction in developing new national infrastructure. The continuous development of technology requires a continuous supply of talents, which will lead to a surge in the number of Artificial Intelligence talents. Therefore, the state promulgated the "New Generation Artificial Intelligence Development Plan" and the Ministry of Education's "Several Opinions on "Double First-Class" Construction of Higher Education Institutions to Promote Discipline Integration and Accelerate the Training of Graduate Students in the Field of Artificial Intelligence" [1], are both to ensure the balance of supply and demand of talents, the reasonable structure of the training system, and the matching of talent quality. To cultivate innovative and compound talents with professional skills, knowledge, and engineering application ability. To give full play to the advantages of undergraduate education and carry out the teaching tasks of new concepts, we must break the experimental teaching scheme under traditional education. In particular, lower grade students are integrated into the teaching process, on the one hand, it can improve students' interest; on the other hand, it can improve students' learning efficiency, optimize the practical effect of Artificial Intelligence introduction, and achieve the expected teaching results in line with the talent training plan.
In the Artificial Intelligence professional personnel training process, the revision of personnel training programs is significant, reflecting that theoretical knowledge and practical links must be closely linked. However, many professional courses do not have

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a complete practical planning scheme, which is relatively single, which brings problems to teaching. The first choice course for lower grade students to enter the Artificial Intelligence classroom is "Introduction to Artificial Intelligence." The teaching effect of the introductory course is directly related to the student's learning cognition and interest in this major. Therefore, creating a first-class course is the core and primary task of the teachers of this course.

2. Artificial Intelligence Major Status Quo Analysis

In 2019, the Ministry of Education selected 39 higher education institutions to offer Artificial Intelligence undergraduate majors. In 2022, 402 higher education institutions opened Artificial Intelligence majors, showing explosive growth in four years. Compared with the rapidly developing Artificial Intelligence industry, the talent training programs offered by the Artificial Intelligence majors offered by colleges and universities in my country are lagging behind. For example, the mismatch of teaching resources, especially the practical courses or useful links, is challenging to meet the teaching design requirements; in addition, the lack of professional teachers' ability, thus affects the progress of teaching and indirectly affects the development of the entire Artificial Intelligence profession. Students in the lower grades lack basic knowledge of programming, algorithms, pattern recognition, and machine learning. [2] The reality is that it is difficult for students to carry out a comprehensive Artificial Intelligence practice course when they study the introduction to Artificial Intelligence course. The course is mainly based on theoretical explanations, and students lack interest. Therefore, the course is not enough to cultivate students' cognition of Artificial Intelligence and improve their interest in learning in a particular program.

3. Introduction to Artificial Intelligence Practical Course Based on K210 Chip

In "Introduction to Artificial Intelligence", it is necessary to introduce the origin and development of Artificial Intelligence. Based on knowledge representation, it uses forms such as production representation, knowledge graph, first-order predicate logic, state space method, and reduction method to represent knowledge so that machines can understand it, and further use various algorithms to obtain machine imitation and machine decision-making. In the introduction course of Artificial Intelligence major, it is necessary to fully mobilize students' interest in learning and guide students to understand the development direction and application fields of Artificial Intelligence. Therefore, the design of practical course is particularly important. Practical courses need to rely on hardware equipment as the basis. With the technological development of Artificial Intelligence chips, K210 chip is a good choice. [3-5]

There are 115 pieces of research literatures on the introduction to Artificial Intelligence, of which there are more than 70 from 2018 to 2022, of which 48 are from 2020 to 2022. These literatures mainly study the teaching mode of courses, curriculum reform and practice, curriculum ideology and politics, Artificial Intelligence school-enterprise cooperation courses based on Baidu Paddle and AI Studio platforms, and preliminary exploration of practical teaching modes based on new engineering. [6-7] There are 84 works of literature on K210, mainly using K210 for Artificial Intelligence application research, including face recognition applications and designing and implementing of

various Artificial Intelligence application systems. [8-9] However, scholars have had no reports and research on combining the K210 chip and introduction to Artificial Intelligence practice. The application of the K210 chip in introduction to Artificial Intelligence course is studied to provide helpful reference for the teaching practice of the introduction to Artificial Intelligence course. To sum up, applying the K210 chip to the introduction to Artificial Intelligence course can explore a new model of Artificial Intelligence education, and solve the problem of lack of experimental conditions for Artificial Intelligence majors to a certain extent.[10]

3.1 Hardware System Construction

K210 is a chip with powerful reduced instruction set architecture, using RISC-V architecture. This AI chip mainly integrates a system-on-chip (SoC) with machine vision and machine hearing capabilities. It has a dual-core 64-bit processor and has better power consumption performance, stability and reliability. The chip can be deployed in the user's product in the shortest time, giving the product Artificial Intelligence.

Constructing a suitable hardware system is crucial for introducing Artificial Intelligence practice courses. On the one hand, it is necessary to consider the knowledge of students, and on the other hand, to consider the realization of Artificial Intelligence applications. K210 chip and Arduino chip (hereinafter referred to as "UNO") are used to build an Artificial Intelligence kit (hereinafter referred to as "Xiaozhi"). The smart chipset shown in Figure 1 consists of a K210 chip board and a UNO smart car. The body is disassembled and can be equipped with a K210 chip motherboard. The UNO single-chip microcomputer control chip is designed on the body, mainly used to control motors and other sensors. The main control chip K210 is responsible for completing Artificial Intelligence applications. The main frequency of K210 can exceed 600M to support conventional visual algorithms, compatible with most Openmv algorithms, and support neural network algorithms. The face detection speed (0VGA, RGB image) Al acceleration can reach more than 60 frames, 2.4-inch resistive LCD with a resolution of 240 × (RGB) × 320, a high-definition camera with 2 million pixels, pluggable ultrasonic expansion, and support for Python open source programs.

Figure 1 Physical Map of AI Xiaozhi

The primary function of the smart car is to enhance the scalability and fun of the project. The LCD, microphone and camera on the K210 motherboard can complete the collection of graphics and sound, and provide materials for image recognition and speech recognition. The Python language is easy to use, which reduces the difficulty of learning to a certain extent, allowing students to be familiar with the tasks to be completed by Artificial Intelligence in the early grades.

3.2 Face Recognition Practice Project Design

As a relatively mature application of Artificial Intelligence, face recognition has always been the main direction of Artificial Intelligence research. Face recognition is similar to object recognition. It is a recognition technology based on facial features of the face. Image or video stream is collected through sensors, and the model library is used for automatic detection and tracking for further recognition. The core of face recognition is still based on the model library after training.

Among the Artificial Intelligence introduction practice projects, face recognition is a relatively comprehensive practice project and a typical application of Artificial Intelligence technology. The hardware equipment used in this project is the K210 chip, and the camera is used for data acquisition. The main teaching goal is to familiarize students with the development process of Artificial Intelligence technology applications. Because the lower grade students are not familiar with algorithm and model training, the model of this project has been trained. To complete face recognition, you only need to use Python code to write the camera driver and simultaneously complete the model call and anchor parameters.

Before applying face recognition, you need to use KFLASH software to import the trained face_3M model library to the 0x300000 position of the K210 chip. Face_3M is a library of trained face recognition models. The face recognition process includes initializing the camera for face image acquisition, initializing the LCD for displaying images, setting 10 face anchor point parameters, and loading the face model to identify whether it is a face. The detailed steps include four steps, one is to initialize the model, Two is to set the number of reference points, Three is that the anchor parameter is the variable anchor, and Four is to draw a rectangle and calculate the center point to draw a cross. The design of this case is mainly to let students understand the principles and processes of face recognition, and further increase their understanding of YOLO target detection and recognition. The model download and program flow chart are shown in figures 2,3, and 4.

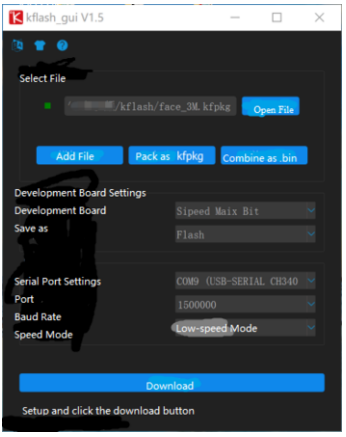

Figure 2 Model Download Interface

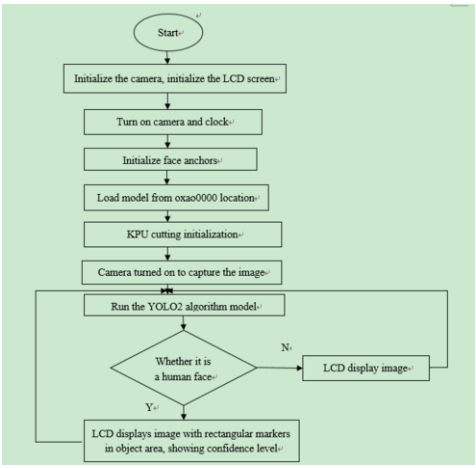

Figure 3 Face Recognition Effect

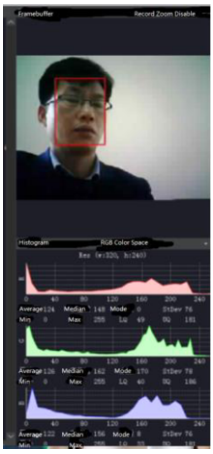

Figure 4 Face Recognition Program Flow Chart

Figure 5 below is part of the critical code for students to realize face recognition. Students can understand the process of face recognition, have a basic understanding of the YOLO2 algorithm, and achieve the guiding role of the introduction to Artificial Intelligence course. Meanwhile, students can also ask their questions about the setting of anchor points, and why these parameters can get better recognition effects. Through the explanation, practice and reflection of this project, a face recognition project has been completed, and the teaching effect of the task-driven has been achieved.

```
import sensor
import lcd
import image
import KPU as kpu
sensor.reset()
sensor.set_pixformat(sensor.RGB565)
sensor.set_framesize(sensor.QVGA)
sensor.run(1)
sensor.skip_frames(10)
lcd.init(freq=15000000,color=0x0000)
anchor= (1.889, 2.5245, 2.9465, 3.94056, 3.99987, 5.3658, 5.155437, 6.92275, 6.718375, 9.01025)
KPU = kpu.load(0x300000)
kpu.init_yolo2(KPU,0.5,0.3,5,anchor)
while True:
    img = sensor.snapshot()
    code = kpu.run_yolo2(KPU,img)
    if code:
        for i in code:
            img = img.draw_rectangle(i.rect(),(255,0,0),2,0)
            x = i.x() + i.w() // 2
            y = i.y() + i.h() // 2
            img = img.draw_cross([x,y],(255,0,0),30,1)
    lcd.display(img)
```

Figure 5 Face Recognition Program Implementation

Face recognition applications with embedded hardware K210, so the use of YOLO algorithm, the algorithm is fast, based on the loading model inside the chip, easy to use. A comprehensive comparison of two popular algorithms: one is the R-CNN series based on the Region Proposal, which belongs to two stages and needs to be generated by using Selective Search or RPN Region (RPN Region) before classification and regression of the Region Proposal; the other is the YOLO used in this project, which uses only one CNN to directly predict the categories and locations of different targets. The precision of the first kind of method is higher, but the speed is slower, the precision of the second kind of method is lower than the first kind, but the speed is faster. So the YOLO algorithm introduced in this paper is more suitable for face recognition with hardware acquisition, and the hardware chip combining AI and IOT will be developed rapidly in the development of AI and IOT, thus promoting the wide application of AI technology.

4. Teaching Effect Evaluation

After using the K210 chip and case teaching in the introductory Artificial Intelligence course, student's interest in the introductory Artificial Intelligence course has increased, and the teacher is responsible for the case explanation and completing the task of "Giving Example". Students complete the "Draw Inference" requirements in the practical examination part after class and at the end of the term. Through three rounds of teaching practice, the case package has been perfected. Judging from the students' final practice assessment, the teaching effect has been improved, eliminating the dullness and poor effect of pure theoretical teaching of this course in the early stage. By introducing practical teaching through the Artificial Intelligence case package, students can complete a comprehensive practical case at the end of the semester. For example, recognizing numbers and speech signals can also raise new questions, such as how to recognize Dongba language, wild fungi, and Naxi language. In this way, students can be guided to explore, step by step, the knowledge map representation of wild fungi, the establishment of the wild fungi identification model library, the establishment of the Dongba language model library, and the establishment of the Naxi language model library. This also achieves the original intention of the Introduction to Artificial Intelligence course to guide students to increase their interest in solving problems.

Table 1 shows the final assessment results of the students. After using these case packages, the students' interest in learning has improved, and their scores have also improved compared with the previous pure theory courses.

Table 1 Students' Final Scores

Grade	Total Number	Average Score	Number of Failed	Number of Excellent (90-100)	Highest Score	Academic Affairs System Student Evaluation	Student Satisfaction
2017	55	68	3	8	88	90 (Excellent)	Average
2018	54	75	0	10	81	94 (Excellent)	High
2019	55	78	0	12	94	96 (Excellent)	High
2020	55	85	0	12	94	96 (Excellent)	High

5. Conclusion

The practical part of the introduction to Artificial Intelligence course plays a vital role in inspiring students and guiding them into the field of Artificial Intelligence. Through K210-based Artificial Intelligence suite design and case package design, teaching resources are enriched to a certain extent, while considering the weak foundation of students entering the field of Artificial Intelligence. Case design using face recognition, image recognition, object recognition, and speech recognition, to a large extent, covers the content of the introduction to Artificial Intelligence course. On the one hand, it enhances students' interest in learning and broadens students' horizons. Through the realization of cases in teaching, students can understand the application field of Artificial Intelligence, and gradually cultivate student's innovative abilities. While understanding the knowledge of Artificial Intelligence, you can have an overview of the knowledge field of Artificial Intelligence, which can also provide a specific reference for the practical teaching of the introduction to Artificial Intelligence course. Of course, the shortcoming is that students lack knowledge about model training. Model training based on YOLO-MARK can be added to subsequent case packages to improve the teaching effect of the entire case package.

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