The 2014 International Conference on Information Technology, Computation and Applications

(ICIITCA 2014)

Anyang, China

Anyang Normal University, 11-13 December, 2014

http://icitca2014.aynu.edu.cn/

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Introduction

ICITCA 2014 is a premier international conference on applied computing and technology. Attendees have the opportunity to hear from expert practitioners and researchers about the latest trends in research and development in their fields. SAC 2014 features three keynote speakers on Wednesday and Thursday. Emerging and development of computational intelligence in remote sensing consisting of mathematical models and nature-inspired models in the past years has broadened the scope of simulation and modeling in many scientific and engineering disciplines. The ICITCA2014, jointly organized by many institutions from Australia, USA, and China, will bring scientists and engineers from different disciplines together to discuss emerging issues, tackle complex problems, and share novel applications in computational science and engineering of multispectral and hyperspectral remote sensing. High quality papers on “Intelligent Techniques for Simulation and Modeling in Remote Sensing” selected from this event will have an opportunity to be published in Mathematical Problems in Engineering after two rounds of review. http://icitca2014.aynu.edu.cn/.
Organizing Committee

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Central Queensland University, Australia

Zhiqiang Ma, Steering Committee Member
Northeast Normal University, China

Heru Xue, Steering Committee Member
Inner Mongolia Agricultural University, China
# Program Schedule

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Keynote 1:

Title: Processing and analysis of hyperspectral images.

Abstract: Hyperspectral image sensors have been important tools for the characterization of materials based on their light reflectance mainly in remote sensing but in other domains as well. Hyperspectral images contain many spectral bands, each revealing the earth surface reflected light at a particular wavelength. These hyperspectral images require specific image processing and analysis methodologies. In this talk, an overview will be given of recent developments in 2 of the most important of these methodologies: hyperspectral image classification and spectral unmixing.

Bio:

Paul Scheunders, Vision Lab, University of Antwerp, Belgium.

Paul Scheunders received the B.S. degree and the Ph.D. degree in physics, with work in the field of statistical mechanics, from the University of Antwerp, Antwerp, Belgium, in 1983 and 1990, respectively. In 1991, he became a research associate with the Vision Lab, Department of Physics, and University of Antwerp, where he is currently a professor. His current research interest includes remote sensing and hyperspectral image processing. He has published over 150 papers in international journals and proceedings in the field of image processing, pattern recognition and remote sensing. Paul Scheunders is associate editor of the IEEE Transactions in Geoscience and Remote Sensing, and has served as program committee member in numerous
international conferences. He is senior member of the IEEE Geoscience and Remote Sensing Society.

Keynote 2:

Title: Non-Volatile-Memory Innovation: From Flash-Memory Cards to In-Memory Computing.

Abstract: As flash memory gains its huge momentum in the storage market, people have high expectation on other potential roles that could be played by non-volatile memory. It has been a grand challenge to position selected non-volatile memory technologies in the memory hierarchy. In this talk, I will take flash memory and phased change memory (PCM) as examples to address the challenges and design methodologies for non-volatile memory as a storage medium or to serve as the role of DRAM. The talk will be concluded by moving the discussion forward to the opportunities of non-volatile memory in system designs, such as server cache and data storage in data manipulation.

Bio:

Prof. Tei-Wei Kuo received his B.S.E. and Ph.D. degrees in computer science from the National Taiwan University and the University of Texas at Austin in 1986 and 1994, respectively. He is currently a distinguished professor of the Department of Computer Science and Information Engineering, National Taiwan University, where he was the department chair between 2005 and 2008. He is also the executive director
and a research fellow of the Intelligent and Ubiquitous Computing Thematic Center of the Research Center of the IT Innovation, Academia Sinica, Taiwan.

The research areas of Prof. Kuo include embedded systems, real-time systems, and non-volatile memory. He has published a number of papers in top journal and conferences with three best paper awards of ACM/IEEE conferences of his fields so far and owns more than 15 patents in flash memory storage systems and real-time operating systems. His honors include IEEE Fellow, the Distinguished Research Award from the National Science Council of Taiwan, the Young Scholar Research Award from the Academia Sinica, and the Ten Outstanding Young Persons Award of Taiwan. He serves in the editorial board of the Journal of Real-Time Systems, IEEE Embedded Systems Letters, and IEEE Transactions on Industrial Informatics. He was a Program Chair and a General Chair of the IEEE Real-Time Systems Symposium (RTSS) and serves as a program committee members of many top conferences in his fields, such as DAC, RTAS, EMSOFT, CODES+ISSS, ICDCS, etc.

Keynote 3:

Title: Classification of Remote Sensing Data from the Geographic Perspective.

Abstract: Classification of image mainly includes three parts: classifier, trained data and input feature. To maximize the separation of the classification feature, the classifier is developed more and more complex and the classification features are added as much as possible. However, for the remote sensing data classification, some simple approaches would be better. In this presentation, three approaches to
classifying the remote sensing data are proposed. (1) Detection of cloud from the time series observations. We find there is an inflexion between clear-sky and cloudy observations in same locations of all observations are sorted. This inflection can be used as the threshold to separate the clear-sky and cloudy observations; (2) Detection of cloud from the multi-spectral image. The spectral functions are different for different cloud types. We proposed the feature with the maximum distinguishability was taken as the classification feature, which is better than current approach uses all the bands. (3) Classification of time series observations. In time series observations with high frequency, there is large redundant and contaminated information. We use the geographic knowledge to composite time series observations to some simple layers, which simultaneously reduce the feature number and improve the data quality. After composite procedure, the distinguishability of classes is enhanced so a simple threshold can separate two classes.

**Bio:**

Dr. Ronggao Liu is the Deputy Director of the State Key Lab of Resources and Environment Information System, Director of the Data Center for Resources and Environment, and Professor in the Institute of Geographic Sciences and Natural Resources, Chinese Academy of Sciences.

He has devoted to the research on huge volume remote sensing data processing for more than ten years. He has established a comprehensive system to process remote sensing data from the Level 1B to product and applications. In the development of
algorithms, he proposed a framework for the quantitative fusion of multi-sources remote sensing to retrieve the land surface parameters, and a new approach to process the historical low quality archived remote sensing data, such as AVHRR, to build the long-term parameter for monitoring the land surface change. A geographic ruler based classification method to extracting the land surface feature from the remote sensing on a globe has been proposed. These methods have largely improved the quality of surface parameters.
Papers

Session 1: Image Processing and Machine Vision

A Modified Local Binary Patterns for Image Texture Classification

Enmin Song, Xiang Li, Ning Pana, Lianghai Jin, Yihua Lan, Chih-Cheng Hung
School of Computer Science and Technology, Huazhong University of Science and Technology

Abstract: In this study we modified the local binary pattern operator (LBP) to obtain the robust invariant texture patterns for image texture classification. The modified method will be able to calculate patterns which are invariant for translation, scaling, rotation and reflection. Therefore, the modified LBP is called R-LBP. Although many variants of LBP have been proposed, most of them cannot detect and recognize the patterns of reflection. Both clockwise and counter clockwise coding is used in the proposed R-LBP operator in order to derive a minimum code to representing the pattern. Experimental results show that the proposed method is effective in determining the invariant patterns for image texture classification.

An Inequality Constraint-based Active Contour Model for CT Images

Segmentation

Changli Feng, Jianxun Zhang, Ning Li, Rui Liang

Abstract: Traditional level set methods are sensitive to the position or the the shape of initial contours and cannot handle inhomogeneous images. In order to overcome those drawbacks, a new local intensity information-based active contour model with an inequality constraint is proposed for segmenting medical images in this paper. A new edge detection function is introduced by means of the structure tensor theory first and foremost, which can catch object boundaries more accurately. Then an inequality constraint is constructed by using the new edge detection function, which can strictly ensure that the zero level set lies in the neighborhood of the edge in the whole evolution. With the help of the local intensity fitting model, an inequality constrained minimization problem is presented. Finally, the constrained minimization problem is transformed into a universal active contour model through the outer point method, and it is solved by the partial different equation method. Experiments for real and synthetic images show that the proposed model is robust to numerous kinds of initial contours and can handle images with intensity inhomogeneity and noises. In addition, the proposed model is applied to handle chest CT images, the promising results demonstrate that the proposed model is able to segment CT images efficiently.
Machine Vision Based Automatic Recognition Method of Indicating Value of Pointer Gauge

CHI Jiannan, LIU Lei, LIU Jiwei, JIANG Zhaoxuan, ZHANG Guosheng
School of Automation and Electrical Engineering, University of Science and Technology Beijing

Abstract: This paper proposes an automatic reading approach of pointer gauge based on computer vision. From big region to small region, aiming at the defects of current automatic recognition method of pointer gauge, the method has superior performance in the accuracy and stability of reading identification by using a coarse-to-fine scheme. The approach first locates the dial region and its center by the region growing method. Then it determines the circular scale region under polar coordinate system and detects the scale marks using the improved central projection. In the following step the border detection is implemented in the dial image, and Hough transform is used to obtain the pointer direction by pointer contour fitting. Finally, the reading of the gauge is obtained by comparing the location of the pointer with the scale marks. The experimental results demonstrate the effectiveness of the proposed approach. The approach is applicable for reading gauges whose scale marks are evenly distributed as well as for those that are not.

Hierarchical Detection of Wildfire Flame Video from Pixel Level to Semantic Level

Yaqin Zhao
College of Mechanical and Electronic Engineering, Nanjing Forestry University

Abstract: The importance of flame detection cannot be ignored in a wildfire video surveillance system due to disturbance of dense fog and challenging of smoke detection. In this paper a novel method for hierarchical detection of wildfire flame video is presented. Specifically, wildfire flame images are gradually recognized from pixel based low-level visual feature to video clip based high-level semantics. For all the pixels of one image, the pixels which meet color rules and motion characteristics are labeled as flame-like pixels. The candidate flame region roughly generated by flame-like pixels is divided into non-overlapped small-sized image blocks. The blocks are recognized using K-SVD learned dictionaries to more accurately segment candidate flame region and exclude some non-flame regions. To reduce the cost of computation, the proposed method detects 1/2F_{rate} (F_{rate} denotes one frame rate) frames instead of one frame at a time by using a sliding time window. Flicker features and spatio-temporal features extracted from video clips of the size rateF are used to build semantic model of wildfire flame video recognition based on mathematical model of meaning. Experimental results show that the proposed approach can effectively segment flame region and significantly improve the performance of wildfire flame detection.
Adaptive Fast Marching Method for Automatic Liver Segmentation from CT images

College of Computer and Information Technology, Nanyang Normal University

Abstract: Liver segmentation is a fundamental step in computer-aided liver disease diagnosis and surgery planning. For the sake of high accuracy and efficiency, in this study, the authors present an automatic seed point selection method and an adaptive fast marching method (FMM) for liver segmentation. The automatic seed point selection method is according to the structure and intensity characteristics of liver. The proposed adaptive FMM is self-adaptive parameter adjustment. The arrival time parameter $T$ in FMM is adjusted according to the intensity statistics of the possible liver region, which can be used to estimate the size of liver region on the corresponding computed tomography (CT) slices. The proposed algorithm consists of the following steps. First, a thresholding operation was applied to remove the ribs, spines, and kidneys, followed by a smooth filter for noise reduction and a nonlinear gray scale converter, which was used to enhance the contrast of the liver parenchyma. Second, the seed points located in the liver were selected automatically. Finally, using the processed image as a speed function, adaptive FMM was employed to generate the liver contour. Clinical validation has been performed on 30 abdominal CT data-sets. The proposed algorithm achieved an overall true positive rate of 98.7%, false negative rate of 1.6%, false positive rate of 5.2%, and the DICE coefficient of 96.7%. It takes about 0.30s for a $512 \times 512$-pixel slice. The method has been applied successfully to achieve fast and accurate liver segmentation.

An Unsupervised Classification Method of Fully Polarimetric SAR Image Based on Polarimetric Features and FCM

Xiaorong Xue, Hongfu Wang, Fang Xiang
School of Computer and Information Engineering, Anyang Normal University

Abstract: An unsupervised classification method of fully polarimetric SAR data based on polarimetric features and FCM is proposed. Firstly, based on the scattering mechanism, the result obtained by $H/\alpha/A$/SPAN classification is used to initialize the clustering centers in FCM, and the initial classification of each pixel is also given. Based that, the iterative classification of polarimetric SAR data are carried on. In the process of operation, complex Wishart distance based on maximum likelihood criterion are introduced to improve the performance of classifiers. The experimental results show that the proposed method is superior to the traditional classification methods of fully polarimetric SAR classification.
A color texture image segmentation method based on fuzzy c-means clustering 
and region-level Markov random field model

Guo-Ying Liu, Pengwei Li, and Yun Zhang
School of Computer and Information Engineering, Anyang Normal University

Abstract: This paper presents a variation of the Fuzzy Local Information C-Means clustering (FLICM) algorithm that provides color texture image clustering. The proposed algorithm incorporates region-level spatial, spectral and structural information in a novel fuzzy way. The new algorithm, called RFLICM, combines FLICM and region-level Markov random field model (RMRF) together to make use of large scale interactions between image patches instead of pixels. RFLICM can overcome the weakness of FLICM when dealing with textured images and at the same time enhances the clustering performance. The major characteristic of RFLICM is the use of a region-level fuzzy factor, aiming to guarantee texture homogeneity and preserve region boundaries. Experiments performed on synthetic and remote sensing images show that RFLICM is effective in providing accuracy to color texture images.

Session 2: Language Processing and Characters Calculation

Calculation of Sentence Semantic Similarity Based on Syntactic Structure
Li Xiao, Li Qingsheng
School of Computer and Information Engineering, Anyang Normal University

Abstract: Combined with the problem of single solving direction of the existing sentence similarity algorithms, this paper proposes an algorithm for sentence semantic similarity based on syntactic structure. First, analyze the sentence composition, then convert the sentence similarity into the words similarity through analysis and convert the words similarity into concept similarity through words disambiguation on the basis of syntactic structure, finally, realize the semantic similarity comparison. It also gives the comparison rules in more detail for the modified words in the sentence which also have certain contribution to the sentence. Under the same test condition, the experiments show that the proposed algorithm is more intuitive understanding of people and has higher accuracy.

Word sense disambiguation for Chinese based on semantics calculating
Yuntong LIU
School of Computer and Information Engineering, Anyang Normal University

Abstract: In order to using semantics more effectively in natural language processing, a word sense disambiguation method for Chinese based on semantics calculating was proposed. The word sense
disambiguation for a Chinese clause could be achieved by solving the semantic model of the natural language; and each steps of the word sense disambiguation process were discussed in detail; and the computational complexity of the word sense disambiguation process were analyzed. Finally some experiments were finished to verify the effeteness for the method.

**Dynamic Generation and Editing System for Wrongly Written Chinese Character Font**

Li Xiao, Li Qingsheng

School of Computer and Information Engineering, Anyang Normal University

**Abstract:** The uniqueness of Chinese makes the Chinese language have become a hotspot in language learning. In view of the problem of wrongly written character teaching in Chinese language teaching, it provides a simple, convenient and efficient input method of wrongly written characters and realizes a dynamic generation and editing system for wrongly written Chinese character font, which solves the problems of real-time edit, coding and input of wrongly written character in editing process using dynamic editing technology, and provides a convenient input method of wrongly written character in editing, printing, typesetting and the research of digital Chinese language teaching. This method can also be used in ancient variant dynamic editing, generation and processing of ancient variant, Oracle, bronze and folk combined characters

**Modeling of University Knowledge Supernetwork Based on Agent**

ZHAO YeQing

School of Computer and Information Engineering, Anyang Normal University

**Abstract:** According to the characteristics of multidimensional, multi-level and dynamic complexity of knowledge organization system and initiative, adaptability and purposefulness of knowledge mainbody in university knowledge diffusion, the agent-based supernetwork model of the university knowledge diffusion was established by complex adaptability system theory and supernetwork analysis method, and further the multi-level structure definition of supernetwork and knowledge network of mainbody, element and carrier in the university knowledge organization system were described on detail. On the basis of initialization parameter and simulation of knowledge supernetwork model, the effects of various factors on the university knowledge diffusion were analyzed, so the result was better for us to efficiently guide the knowledge diffusion and the way for students gaining knowledge, especially provide theoretical and practical guidance for establishing harmonious relationship between students and teachers.
Session 3: Controlling, Simulation and Optimization

Research on Evaluation Method Based on Modified Buckley Decision Making and Bayesian Network

Neng-pu YANG, Mei Han, Shi-yong Chen and Xiao-hua Liu
School of Traffic and Transportation, Beijing Jiaotong University

Abstract: Based on modified Buckley Decision Making, the fuzzy probabilities of element factors were calibrated. Then, the structural important degree, probability important degree and critical important degree of each factor were discussed and sorted by the forward and reverse reasoning of Bayesian Network. A numerical example of risk evaluation for dangerous goods transport process was given to verify the method. The result showed that the evaluation method could efficiently identify the weakest element factor. In addition, the reliability and objectivity were greatly improved.

Simulation on Dynamic Envelope Gauge of NX70 Flat Car

Yanhui Han, Mei Han, Chao Chen
School of Traffic and Transportation, Beijing Jiaotong University

Abstract: The current rolling stock gauge for standard gauge railway is a static gauge and the general rules and methods for inspecting of rolling stock gauge are based on a static gauge. The contradiction of large structure gauge and small rolling stock gauge has always existed. It is important to set down the clearance requirements in respect of physical size for the safe passage of rail vehicles. Reasonably determining the maximum vibration offset can improve the efficiency of clearance. Dynamic envelope gauge calculation considers the rolling stock displacement elements much more than before. As an example, analyze the complex vibration of NX70 flat car by simulation test on the running track. Comprehensive considering the track model, loading condition, line conditions and travelling speed, then SIMPACK is used to present the vehicle system dynamics simulation model. After analyzed simulation results, respectively determine the maximum vehicle vibration offset and the clearance between the vehicle and the structure gauge for railroads of Class I, Class II and Class III at the center height of gravity 2400mm. It can be conclude that NX70 can pass the curve and straight line safety when the center height of gravity increased to 2400mm.

True Random Number Generator Using Multi-Threads

Xu Juncai, Zhang Weidong, Ren Qingwen, Shen Zhenzhong
State Key Laboratory of Hydrology-Water Resources and Hydraulic Engineering, Hohai University

Abstract: Traditional methods that use software only generate pseudo random numbers and cannot be employed to generate true random numbers. This study explains a method of generating true
random numbers by using software only. The author believes that a computer is a hardware system with randomness and that randomness-induced system instability has a random influence on a multi-threaded process. This study also introduces a method of generating true random numbers with the randomness caused by the damage of multiple threads to the shared resources. On the basis of a series of experiments, this study verifies that the random sequence produced by multiple threads has true randomness with unpredictable data and good safety.

Numerical Calculation and Experimental Investigation on Reconfiguration

Characteristic of Plasma Antenna

ZHU Anshi, CHEN Zili, LIU Xiaqian, ZHEN Yunhui
Mechanical Engineering College, Shijiazhuang 050003, China

Abstract: The reconfiguration characteristic of plasma antenna was studied by using the numerical calculation method and experimental method. The two dimensional plasma antenna reconfiguration model was established by combining the Boltzmann equation and Maxwell equations. The discretization model was derived by using the finite-difference time-domain (FDTD) method. The near-field and far-field radiation pattern was simulated and the results proofed the correctness of this model. The experimental system of plasma antenna was established. Based on this system, the s11 parameter and the radiation pattern were measured. The experimental results showed that by changing the pumping power the characteristic of plasma antenna can be reconfigured.

An Auction-based Approach for Hybrid Access in Macro-Femto Networks

Xun Wang, Tingli Mao, Gang Feng, Liang Liang and Shuang Qin
National Key Laboratory of Science and Technology on Communications, University of Electronic Science and Technology of China

Abstract: Femtocells have been identified as a promising means to provide better coverage and improved voice/data Quality of Service (QoS) with low power and cost in 3GPP/LTE. Hybrid access is regarded as the most appropriate access control policy for macro-femto networks. Nevertheless, wide adoption of hybrid access is hindered by a lack of incentives for the private femto owners to share their resources with non-subscribers. In this paper, we propose an auction-based approach to promote hybrid access in macro-femto networks. We use a forward multi-object auction with package bidding to determine the access point of macro users. The wireless service provider (WSP) sells packages of macro users to the femto owners which are preferred by macro users. Simulation results demonstrate that by introducing hybrid access auction, the throughput of macro users can be substantially improved. In the meantime, the system energy efficiency can also be improved in the sense that the same system throughput can be achieved with lower power consumption.
Shape modification for \( \lambda \)-Bézier curve based on constrained optimization of position and tangent vector

Gang Hu, Xiaomin Ji, Xinqiang Qin

Department of Applied Mathematics, Xi’an University of Technology

Abstract: \( \lambda \)-Bézier curve has shape adjustable property whilst inheriting the properties of traditional Bézier curve as a new kind of curve modeling. In contrast to no algebraic polynomial modelings, \( \lambda \)-Bézier modeling has features such as often resulting in a simple algorithm that is shorter, faster and has easier chosen a parameter. Focusing on the problem of shape modification of \( \lambda \)-Bézier curve, the shape modification of \( \lambda \)-Bézier curve is investigated for constrained optimization of a single parameter in this paper. First, the definition and properties of \( \lambda \)-Bézier curve have been summarized in detail. Then, based on Lagrange multiplier method, the shape modification of \( \lambda \)-Bézier curve is implemented by optimizing \( m-l+1 \) perturbations \( \delta_i \) of control points. Using this algorithm, \( \lambda \)-Bézier curve is modified to satisfy the specified constraints of position vector and tangent vector and satisfy the shape-preserving property. Finally, some curve design applications are discussed, the modeling examples illustrate that the proposed method of this paper can modify the shape of \( \lambda \)-Bézier curve.

Decentralized Control for Large-Scale Interconnected Nonlinear Systems Based on Barrier Lyapunov Function

Tao Guo

School of Computer and Information Engineering, Anyang Normal University

Abstract: The problem of tracking control for a class of large-scale nonlinear systems with partial state constraints is addressed. Special Barrier Lyapunov Function (BLF) is employed to prevent constraint from being violated. By using a BLF, new decentralized tracking control design is presented based on backstepping methodology. The stability analysis of the closed-loop system is provided and all closed-loop signals are ensured to be bounded. Simulation results demonstrate the effectiveness of the proposed approach.
Accommodation

Anyang Huaqiang Jianguo Hotel is located in Anyang high tech Zone, east of Beijing Zhuhai Expressway, west of State Road 107. It is 3 km south away from Anlin high-speed, 10 km away from the Anyang Railway Station, the traffic is very convenient. Huaqiang Jianguo Hotel is the first one of five star standard hotels in Anyang city which invested by Shenzhen Huaqiang group and commissioned by Beijing BTG Jianguo Hotel Management Company Limited.

Address: No. 466, Xiangge Road, Anyang, Henan Province (河南省安阳市高新区弦歌大道 466 号)
Tel: 4007-33-4007
Email: 17880@126.com
Transportation:

1. Anyang Station → Huaqiang Jianguo Hotel

   1) You can take Bus No.26 at Anyang Station bus station, and get off at Huaqiang Jianguo Hotel Station.
2) You can get a taxi at Anyang Station. It is about 10 km from the station to the hotel. The fare is about 18RMB. You can show the following tag to the taxi driver:

请送我到安阳华强建国酒店(安阳市高新区弦歌大道 466 号)

2. Anyangdong Railway Station(高铁站) → Huaqiang Jianguo Hotel

The most convenient way is to take a taxi to arrive Huaqiang Jianguo Hotel at Anyangdong Railway Station. The fare is about 30RMB. You can show the following tag to the taxi driver:

请送我到安阳华强建国酒店(安阳市高新区弦歌大道 466 号)
Conference Transportation

1. Conference Address

Library Meeting Room, Anyang Normal University, Anyang, China

Address: No. 436 Xiange Road, Anyang, Henan (河南省安阳市弦歌大道 436 号安阳师范学院)

2. Transportation

(1) There are buses between Huaqiang Jianguo Hotel and Anyang Normal University arranged by the organizing committee during Dec 12-Dec 13.

(2) Anyang Station-> Anyang Normal University

a. You can take Bus No.26 at Anyang Station bus station, and get off at the North Door of Anyang Normal University Station (在火车站乘 26 路车，在新师院北门站下车)
b. You can get a taxi at Anyang Station. The fare is about 15RMB. You can show the following tag to the taxi driver:

请送我到安阳师范学院弦歌大道校区(安阳市高新区弦歌大道436号)

(3) Anyangdong Railway Station(高铁站)-> Anyang Normal University

The most convenient way is to take a taxi to arrive Anyang Normal University at Anyangdong Railway Station. The fare is about 30RMB. You can show the following tag to the taxi driver:

请送我到安阳师范学院弦歌大道校区(安阳市高新区弦歌大道436号)