



QIDIRILAYOTGAN SHAXSNI TANIB OLISH VA AUTENTIFIKASIYALASH MEZONINI YARATISH

*Turapov Ulug'bek Urazkulovich (Jizzax politexnika institutining
"Kompyter va dasturiy ingiining" kafedrasining professori),*

*Ergashev Mahkamjon Furqat o'g'li , Komilov Burxonjon Mirzoqul o'g'li
,Lolayeva Sohiba Saidovna, Ergashev Sherzod Jumanazarovich (Jizzax viloyati
Zarbdor tuman 2-son politexnikum o'qituvchilari)*

Annotasiya. *Ushbu maqolada qidiralayotgan shaxsni ma'lumotlar bazasidan tanib olish va autentifikatsiyalashda koeffisient korrelyatsiya usuli yordamida aniqlash mumkinligi to'g'risida to'liq ma'lumot berib o'tilgan.*

Kalit so'zlar. *matematik model, intellektual tahlil, autentifikatsiyalash, robot ko'z analizatori, korrelyatsiya koeffitsienti.*

Jahonda ilm fan o'zining rivojlanishi jarayonida yanada murakkabroq ob'ektlarni o'rganishga o'tmoqda. Amaliyotning talablari birinchi navbatda effektli usullarni, matematik modellarni yaratish va uni ob'ekt uchun joriy qilishga katta e'tibor qaratilmoqda.

Hozirgi kunda ma'lumotlarni intellektual tahlil qilish elementlaridan biri bo'lgan biometrik tizimlarda shaxsning yuz tasvirini autentifikatsiyalash masalasi dolzarb muammolardan biri bo'lib qolmoqda. Shaxsning biometrik xususiyatlariga yuz, quloq chanog'i, barmoq izlari, ko'z qorachig'i, qo'l shakli geometriyasi, barmoq izlari, yurish uslubi, ovoz tovushini misol qilib keltirish mumkin. Mazkur sohada rivojlangan xorijiy mamlakatlarda, shu jumladan, AQSH, Rossiya Federatsiyasi, Xitoy, Yaponiya, Janubiy Koreya va boshqa davlatlarda axborot kommunikatsiya texnologiyalarini qo'llab shaxs haqida ob'ekt yaratish, ma'lumotlar to'plash, qayta ishlash, shaxs yuz tasvirini identifikatsiyalash tizimining muayyan bosqichlarga bo'linishi, tasvirlarni piksellarga o'girish va sonli qiymatga ega bo'lgan matritsa va ular asosida ma'lumotlar bazasini yaratish avtomatik tizimda muayyan ishlovchi



robot ko'z analizatori tizimining matematik, dasturiy va texnik ta'minotini yaratishga katta e'tibor qaratilmoqda.

Mazkur vazifalarni amalga oshirish uchun geometrik figuralar yordamida autentifikatsiyalangan tasvirlarning ma'lumotlar bazasini yaratuvchi robot ko'z analizatorini yaratish va unga asosan shaxs yuz tasvirini autentifikatsiyalash jarayonlarini boshqarish tizimlarini yaratish axborot kommunikatsiya texnologiyalarini integrallashuvi sohasini rivojlantirishning muhim dolzarb masalalardan biri hisoblanadi. Asosan bu borada, inson yuz tasviridagi belgilarni ajratish, ularni ma'lumotlar bazasidagi tasvirlar bilan solishtirish, qayta ishlash, hisoblash jarayonlarini parallellashtirish, sonli ko'rinishga keltirish yuz tasvirini kimga tegishli ekanligini aniqlashning o'ziga xos murakkabligi bilan ajralib turadi.

Tadqiqotning maqsadi robot ko'z analizatorida inson yuz tasvirini geometrik karakteristikalar yordamida tanib olishning matematik modellari, algoritmlari va dasturiy ta'minotini ishlab chiqish. Korrelyasiya koeffitsienti usulida videotasvirdagi inson yuz sohasining vizual sifat parametrlariga asosan identifikatsiyalash algoritmini ishlab chiqish;

Ushbu maqolada shaxsni identifikatsiya qilishda korrelyasiya koeffitsienti tahlili asosida yuz tasvirlarining o'xshashlik darajasini aniqlash misollar yordamida tushuntirib berilgan. Jumladan, ikkita haqiqiy sonlar to'plamining korrelyasiya koeffitsienti (KK)ni hisoblashda qo'llaniladigan formulalar keltirilib, bu formulalar yordamida tasvirlarni, ya'ni matritsalarini korrelyasiya koeffitsienti, o'xshashlik koeffitsientlarini hisoblovchi algoritm ishlab chiqilgan.

Ma'lumki, korrelyasion funksiya matematikaning, nazariy fizikaning amaliy masalalarida hamda fan va texnikaning boshqa sohalarida qo'llanilib kelinmoqda. O'z navbatida bu funksiyaning fotoeffekt hodisalarini tadqiq qilishdagi imkoniyatlari haqida ko'pchilik qiziqib ko'rishgan.

Shaxs tasvirlarini solishtirishda ko'pincha ularni bitta masshtabga keltirib olish talab etiladi. Shaxsni identifikatsiya qilish uchun korrelyasion funktsiyani qo'llashdan oldin ham shunday jarayonni bajarish lozim. Ma'lumki, ikkita turli tasvirning yuz sohalarini masshtablash jarayoni izlab topilgan ko'z qorachiq-lari

orasidagi masofaga nisbatan amalga oshiriladi. Ko‘z qorachiqklarining joylashgan o‘rnini katta aniqlik bilan topish mushkul masala. Bunday masalalar ko‘pincha tanlangan usulning hususiyatiga bog‘liq holda bir yoki bir necha piksel hatolik bilan hal qilinadi.

O‘z navbatida bunday aniqlik bilan masshtablangan yuz tasvirlari bir biriga nisbatan biroz siljib qoladi. Albatta bunday xatoliklar ikkita tasvirni solishtirish jarayonida tanib olish aniqligini tushirib yuboradi va o‘z-o‘zidan bunday xatolikni kamaytirish masalasi paydo bo‘ladi.

Aytaylik, $X = \{x_{ij}\}_{i=1}^N$ va $Y = \{y_{ij}\}_{i=1}^N$ ($i = \overline{1, N}$) haqiqiy sonlar to‘plamlari berilgan bo‘lsin. Bu to‘plamlar uchun matematik kutilmani aniqlaymiz: $MX = \frac{1}{N} \sum_{i=1}^N x_i$ $MY = \frac{1}{N} \sum_{i=1}^N y_i$ shundan so‘ng matematik kutilmasi nolga teng bo‘lgan yangi, X, Y , to‘plamlarni hosil qilamiz:

$$\overline{X}_i = (x_i - MX), \quad \overline{Y}_i = (y_i - MY). \quad (1)$$

$\overline{X}, \overline{Y}$ to‘plamlar uchun korrelyasion funksiyaning diskret formulasi yoki korrelyasiya koeffitsienti quyidagicha ko‘rinishga ega bo‘ladi:

$$Cor_{vec} = \frac{\sum_{i=1}^N \overline{X}_i \cdot \overline{Y}_i}{\sqrt{\sum_{i=1}^N \overline{X}_i^2 \cdot \sum_{i=1}^N \overline{Y}_i^2}} \quad (2)$$

Agar massiv elementlari $\{A_{ij}\}_{m \times n}$ va $\{B_{ij}\}_{m \times n}$ ko‘rinishidagi matritsani tashkil etsa, u holda korrelyasiya koeffitsienti quyidagicha hisoblanadi:

$$Cor_{mat} = \frac{\sum_{i=1}^M \sum_{j=1}^N \overline{A}_{ij} \cdot \overline{B}_{ij}}{\sqrt{\left(\sum_{i=1}^M \sum_{j=1}^N \overline{A}_{ij}^2 \right) \cdot \left(\sum_{i=1}^M \sum_{j=1}^N \overline{B}_{ij}^2 \right)}} \quad (3)$$

bu erda

$$\overline{A_{ij}} = \left\{ (A_{ij} - MA) \right\}_{j=1, \overline{N}}, \quad \overline{B_{ij}} = \left\{ (B_{ij} - MB) \right\}_{j=1, \overline{N}},$$

$$MA = \frac{1}{M \cdot N} \sum_{i=1}^M \sum_{j=1}^N x_{ij}, \quad MB = \frac{1}{M \cdot N} \sum_{i=1}^M \sum_{j=1}^N y_{ij},$$

Yuqoridagi formulalar yordamida tasvirlarni, ya'ni matritsalarini (qator, ustun va matritsa bo'yicha) korrelyasiya koeffitsienti, ya'ni o'xshashlik koeffitsientlarini hisoblovchi algoritm va amaliy dasturi ishlab chiqiladi. Unda hisob-kitob ishlari matritsalarini bir necha pikselga siljigan holatlar uchun ham bajarildi va ular ichidan maksimal qiymatlar tanlab olindi. Shuni eslatib o'tish joizki, boshlang'ich ma'lumotlar matritsa $\{A_{ij}\}_{m \times n}, \{B_{ij}\}_{m \times n}$ ko'rinishidagi ikki o'lchovli massivlar hisoblanib, unda ikkita tasvir, ya'ni odam Yuzi tasviri raqamli piksellarda aks etgan. Har bir pikseldagi rang qiymati 0 dan 255 gacha bo'lgan butun sonlardan iborat bo'lib, tasvir kulrang holatda bo'ladi. Shuningdek, matritsalarini masshtablash orqali bir o'lchovga keltirildi.

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