Automated Access Control via License Plate recognition using Neocognitron Neural Network

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Outline

- Problem definition
- Neocognitron Neural network
- Adapted version of original Neocognitron to recognize license plates
- Characteristics of Dutch license plates
- Database of Dutch license plate
- Workbench of license plate recognizer
- Test results
- Conclusion

Problem definition

- Is it possible to use an adapted version of the Neocognitron Neural network to recognize Dutch license plates automatically in real time.
- The recognised license plate may be used to check access control of the car and its driver

Procedure

- Design an adapted version of the Neocognitron Neural network designed by Fukushima to recognise handwritten symbols
- Define characteristics of Dutch license plates to facilitate the recognition
- Design a special database of Dutch license plate to train the neural network
- Train and test the adapted Neocognitron Neural Network
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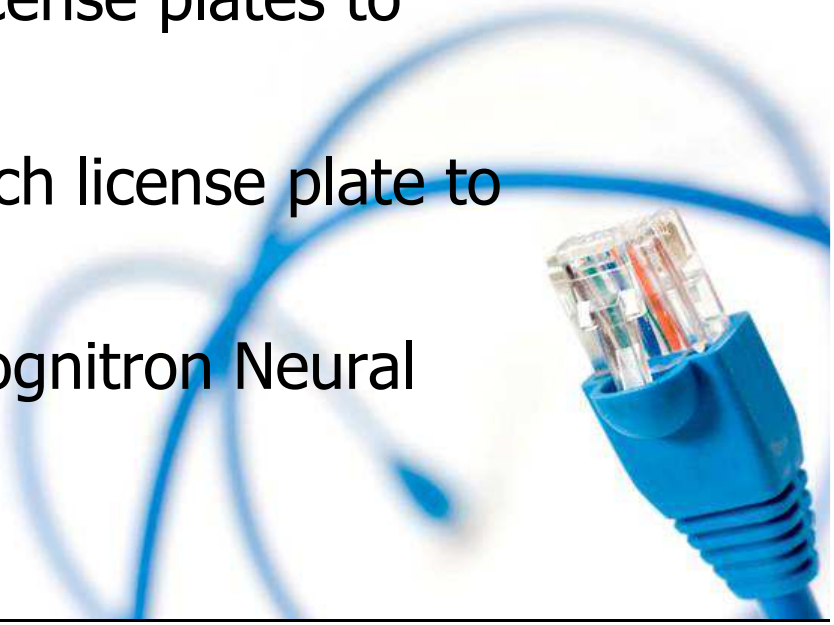
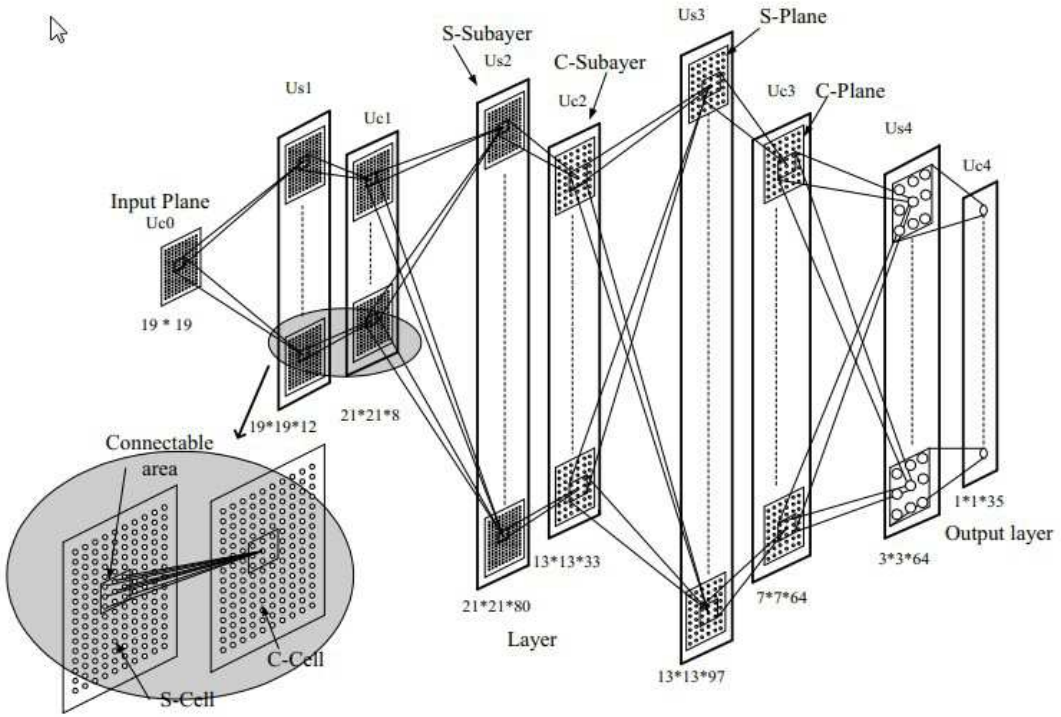
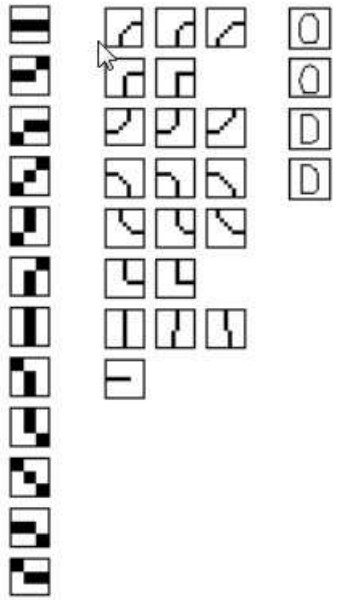


The architecture of the Neocognitron neural network

The network is composed of several connected layers. The first layer is used to recognise simple line segments of three pixels in several positions.

In the next layer composites of the simple line segments will be recognised , up to the final layer which will be used for recognition of a character





Characteristics of Dutch License plates

A Dutch license plate is a specific string of numbers and characters satisfying specific grammar rules

Series	Year	Combination	Series	Year	Combination
1	1951	XX-99-99	8	2009	9-XXX-99
2	1965	99-99-XX	9	2006	XX-999-X
3	1973	99-XX-99	10	2008	X-999-XX
4	1978	XX-99-XX	11	2015	XXX-99-X
5	1991	XX-XX-99	12	-	X-99-XXX
6	1999	99-XX-XX	13	2016	9-XX-999
7	2005	99-XXX-9	14	2019	999-XX-9
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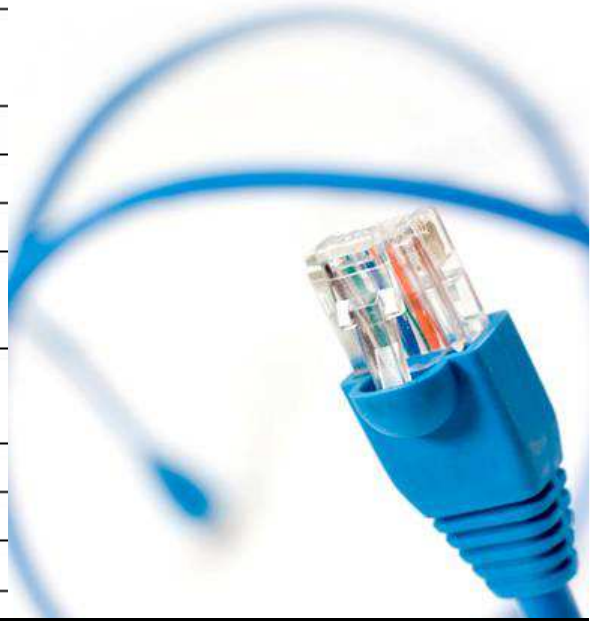
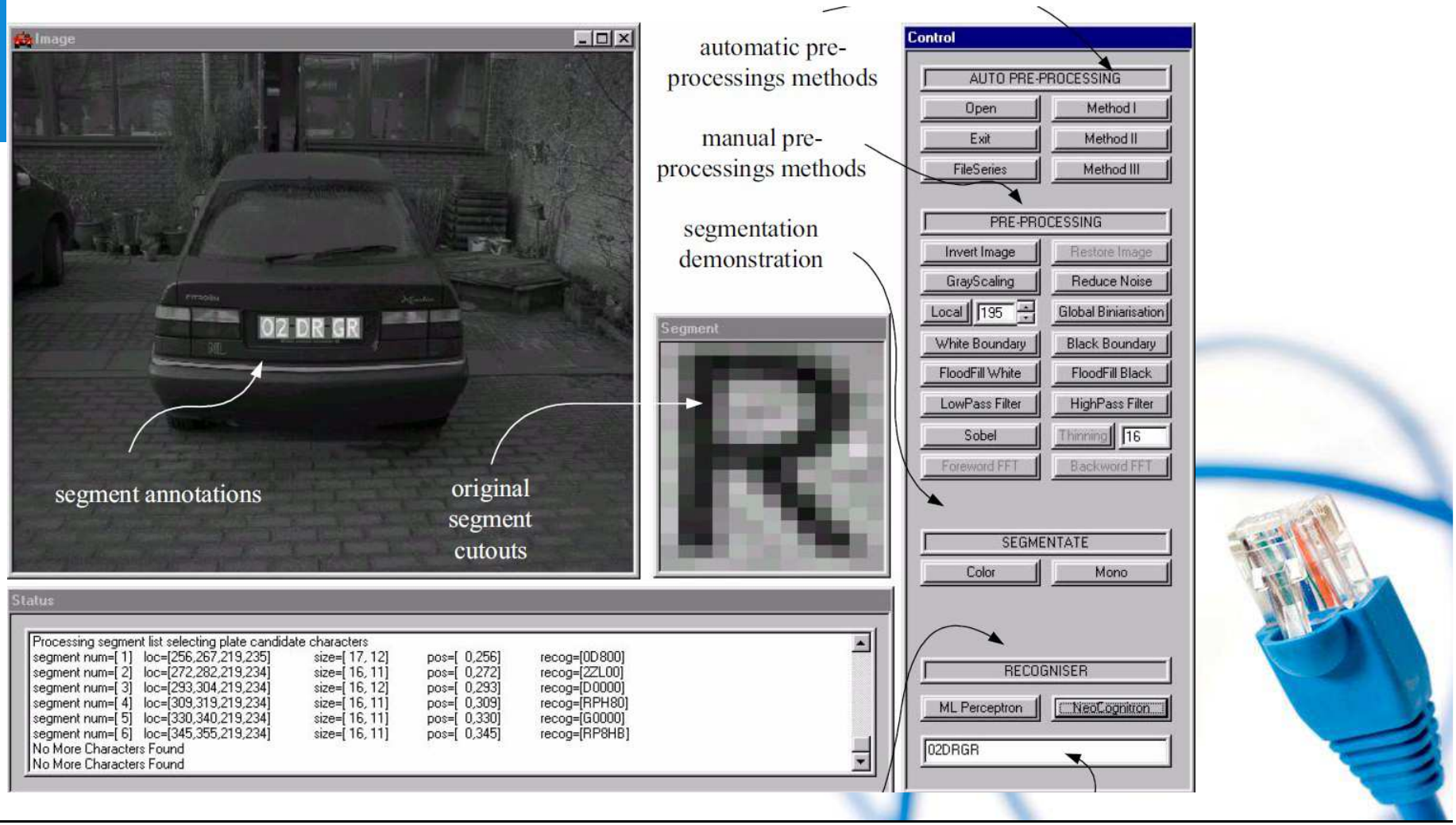


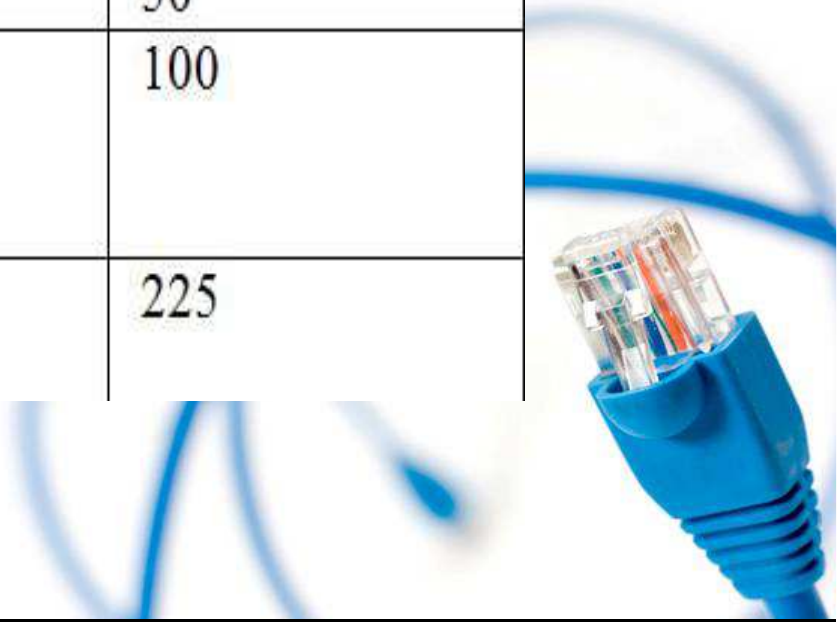
Workbench with image processing tools and Neocognitron



Entrance barrier of the Netherlands Defence Academy used to record license plates

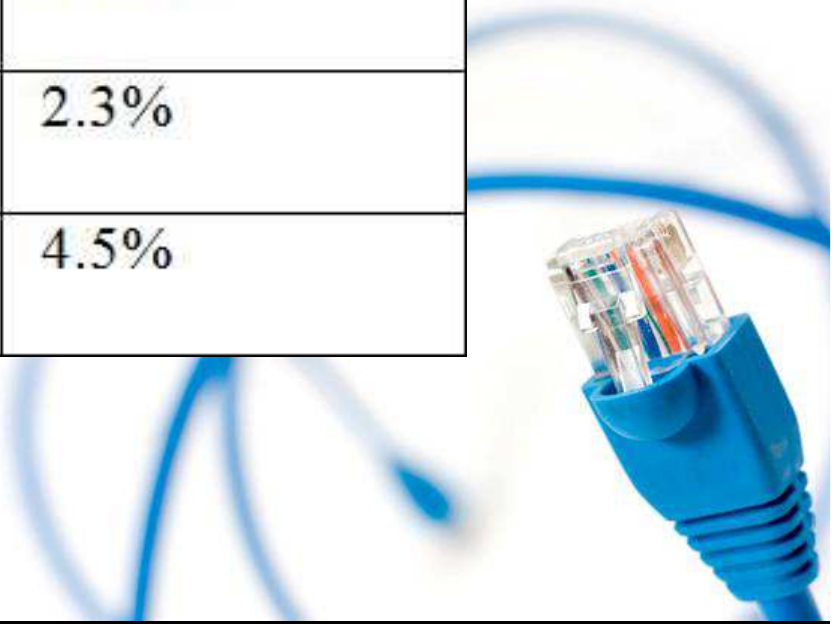
Composition of database of Dutch license plates recorded at the Netherlands Defense Academy, Dutch Highways and inner city of Delft

Location of recordings	Single pictures	Videos
Inner city of Delft	300	50
Recordings at the entrance of Military Defence Academy	150	100
Recordings traffic on the highway	-	225



Recognition rate of the Dutch license plate recogniser using Neocognitron Neural network

Recognition rate (correctly classified license plates)	93.2%
Error rate (misclassified plates)	2.3%
Rejection rate (unclassified plates)	4.5%



Questions?


thank you
danke
謝謝
ngiyabonga
teşekkür ederim
gracias
спасибо
Баярлалаа
рахмат
dank je
bedankt
dziękuję
hvala
mauruuru
obrigado
sukriya
kop khun krap
terima kasih
감사합니다
ありがとう
grazie
arigatō
takk
dakujem
мерси
merci
go raibh maith agat
mochchakkeram
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