

Όραση Υπολογιστών: Τεχνική Αναφορά 1^{ης} Εργασίας

• Επιλογή Φίλτρου

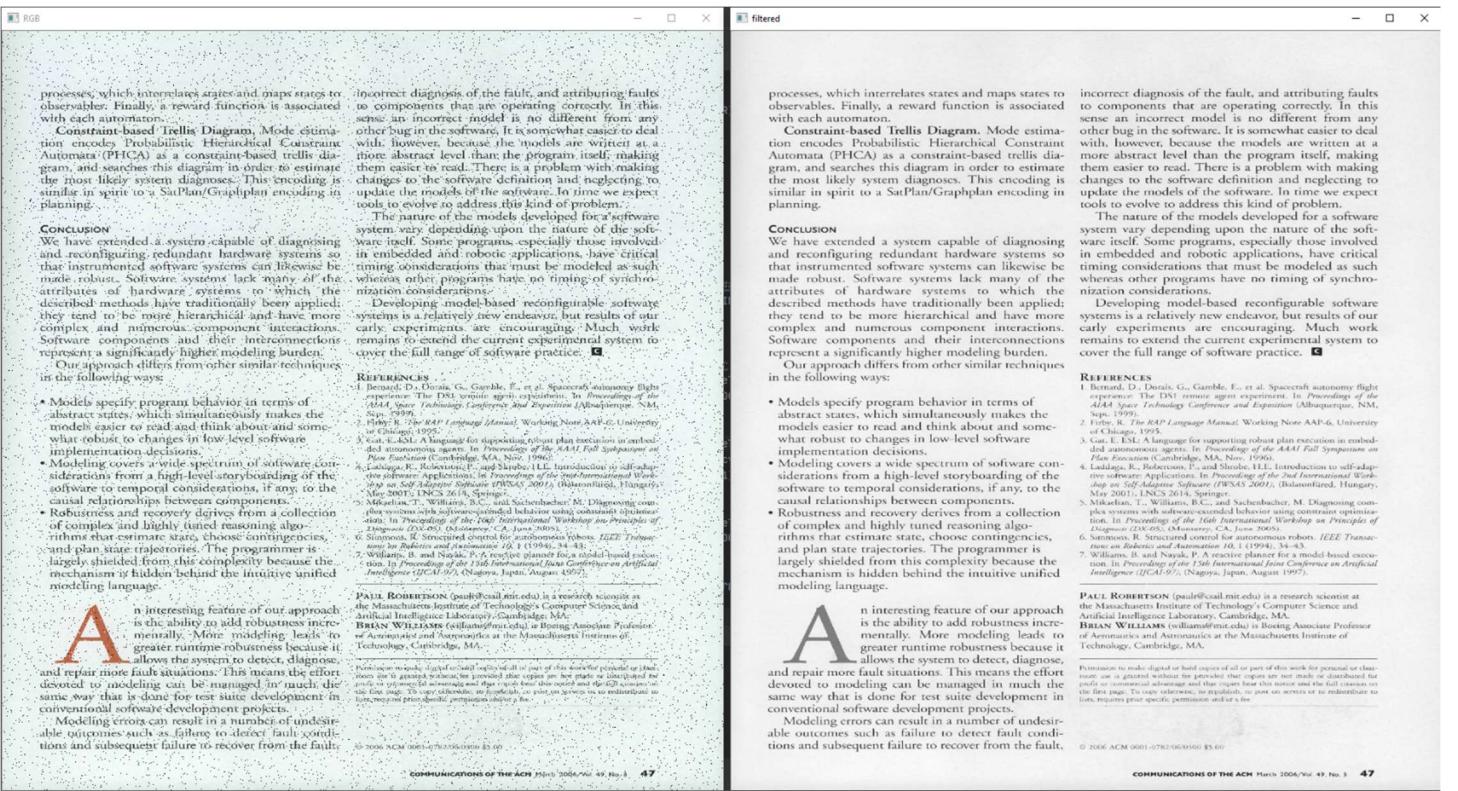
x-1,y+1	x,y+1	x+1,y+1
x-1,y	x,y	x+1,y
x-1,y-1	x,y-1	x+1,y-1

Εικ1.Σχηματική υλοποίηση του median φίλτρου

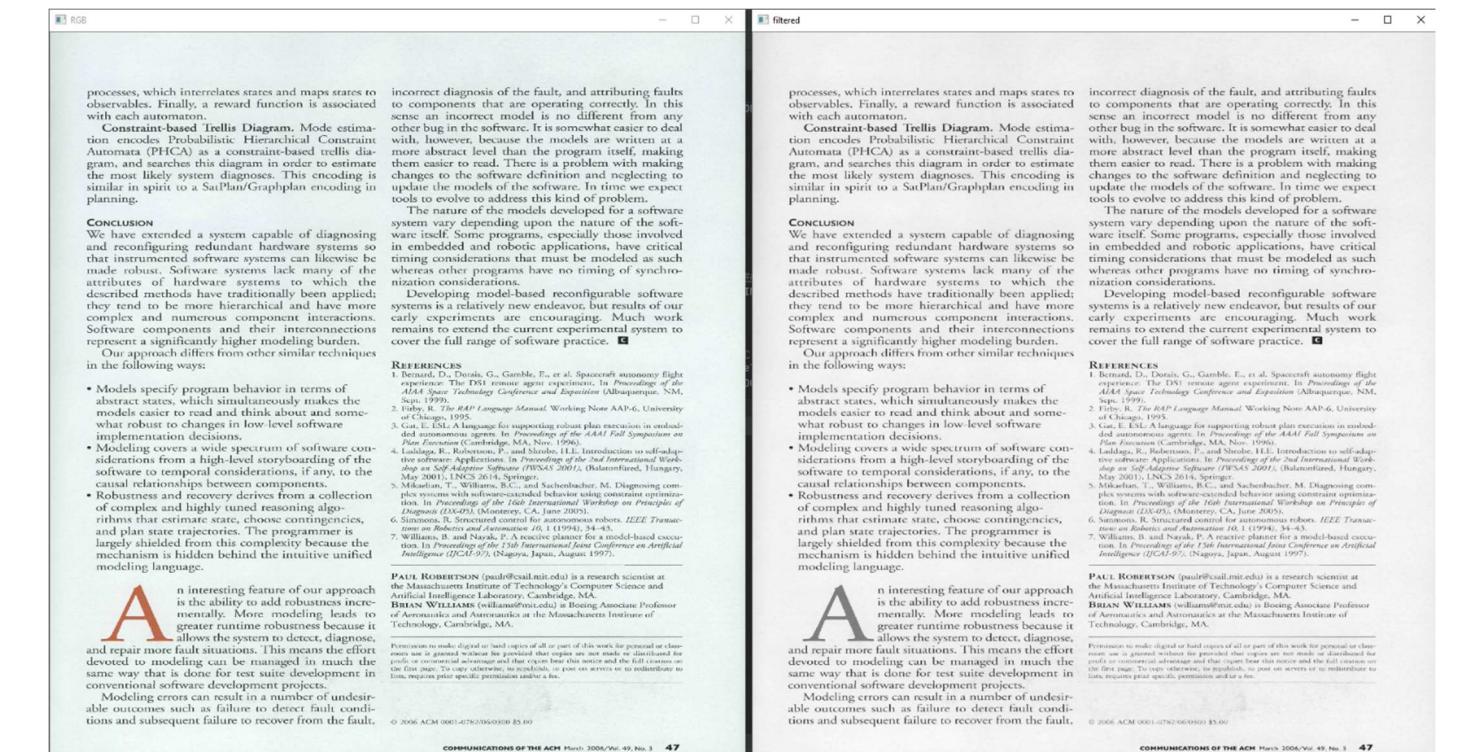
```
def median(imggr): #manual implementation of median filter
    imgf=imggr
    for x in range(0,(imggr.shape[0]-1)):
        for y in range(0,(imggr.shape[1]-1)):
            window = [imggr[0, 0]] * 9
            window[0] = imggr[x-1,y-1]
            window[1] = imggr[x,y-1]
            window[2] = imggr[x+1,y-1]
            window[3] = imggr[x-1,y]
            window[4] = imggr[x,y]
            window[5] = imggr[x+1,y]
            window[6] = imggr[x-1,y+1]
            window[7] = imggr[x,y+1]
            window[8] = imggr[x+1,y+1]
            window.sort()
            imgf[x,y]=window[4]
    return imgf
```

Εικ2.Υλοποίηση του φίλτρου στην Python

Το φίλτρο που επιλέχθηκε και υλοποιήθηκε είναι ένα μη γραμμικό φίλτρο ενδιάμεσου όρου(median filter).Η επιλογή βασίστηκε στο γεγονός ότι πρόκειται για το φίλτρο που αντιμετωπίζει καλύτερα το είδος θορύβου στις εικόνες της εργασίας(salt & pepper noise).Επειδή το φίλτρο χρησιμοποιεί την ενδιάμεση τιμή από όλες τις τιμές της γειτονιάς(παραθύρου) γύρω από το εικονοστοιχείο που μας ενδιαφέρει και αντικαθιστά την τιμή σε αυτό,προκύπτει ένα ομοιόμορφο αποτέλεσμα(όπως προκύπτει και με τα αποτελέσματα των εικόνων παρακάτω).Η υλοποίηση του έγινε με την χρήση δύο for-loops,όπου η 1η διατρέχει την μια διάσταση,και η 2η την άλλη.Συγκεκριμένα,κατασκευάζεται και αρχικοποιείται με τιμές του 1ου εικονοστοιχείου της εικόνας το παράθυρο,διαστάσεων 3x3διότι μας δίνει το καλύτερο δυνατό αποτέλεσμα και στην συνέχεια αντικαθιστούμε σε κάθε εικονοστοιχείο της αρχικής εικόνας,το αποτέλεσμα από το φίλτράρισμα(την τιμή του παραθύρου στην θέση(x,y)).Ωστόσο,το μειονέκτημα της συγκεκριμένης υλοποίησης είναι ότι λόγω των 2 for-loops,υπάρχει αυξημένος χρόνος εκτέλεσης.Προσωπικά,θεωρώ πως η ποιότητα του τελικού αποτελέσματος αξίζει την χρονική καθυστέρηση που προκύπτει.Ακολουθούν τα αποτελέσματα για κάθε μια από τις εικόνες του database,σε σύγκριση με την αρχική.



Eik3. Σύγκριση πριν(αριστερά) και μετά(δεξιά) το φίλτραρισμα για την εικόνα 2_original.png



Eik4. Σύγκριση πριν(αριστερά) και μετά(δεξιά) το φίλτραρισμα για την εικόνα 2_noise.png

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“**Elements of Leadership**

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clearly the right things, consistently and with commitment, operate at a higher ethical level than those in the raw pursuit of more. People respond very positively to this demonstrated ethic and identify with and engage themselves in the success of the initiative.

Executive Leadership

So how does an organization truly demonstrate and operationalize this commitment? Bob Galvin achieved this at Motorola through his personal attention and time, but this is quite rare. Few CEOs seem to have the time available to commit to a small number of high-priority issues (apart from that “making money” one). Or perhaps there are so many pressing issues that it is difficult to focus on just one or two. One thing I have found essential to the success of (particularly) a software process change initiative is to assign an “operational execu-

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The Operational Executive Sponsor

The mechanism that seems to work best is the assignment of an operational executive sponsor. This is someone in authority who is able to attend to the daily sponsorship needs of the initiative. It must be someone with sufficient authority to be able to rattle a cage or overcome an obstacle when the need arises. It cannot be someone too high up in the organization, if the span of control means that appropriate and continual attention cannot be paid to the process initiative. This person cannot be too low in the organization if that means he or she cannot exert sufficient authority when needed.

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- **Line authority**, it may be helpful if the operational executive sponsor also has line-management duties. When a leader is responsible for a significant production activity their role carries a certain weight with practitioners that a corporate or a staff role may not. Out of the line development, the sponsor might have the conferred authority but might not be able to exert sufficient influence.

- **Intellectual authority** is the idea or “thought leadership” component. It is very valuable if the operational executive sponsor is a thought leader in the organization and carries authority that is not simply conferred by position. People are more likely to listen to and follow a sponsor when the sponsor’s role is also backed by a certain amount of earned professional respect.

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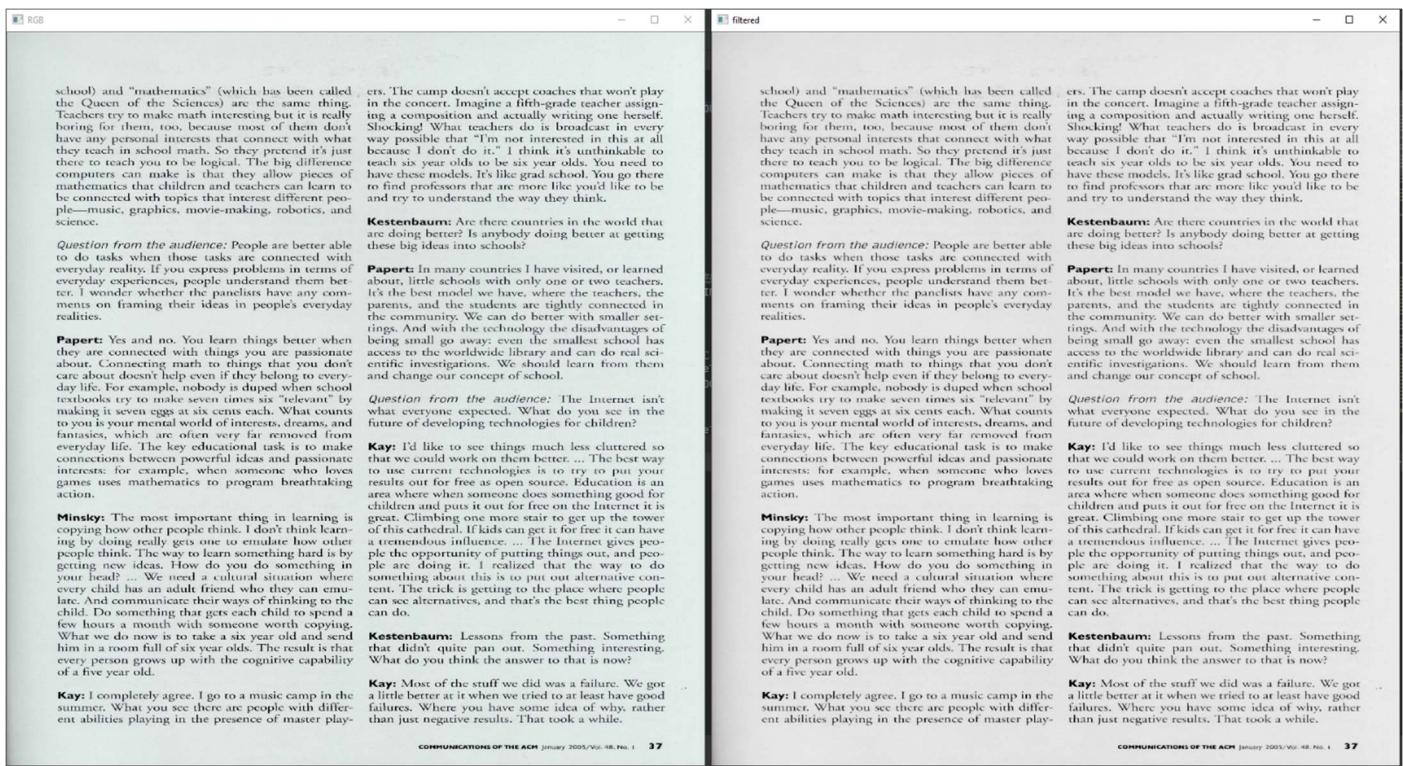
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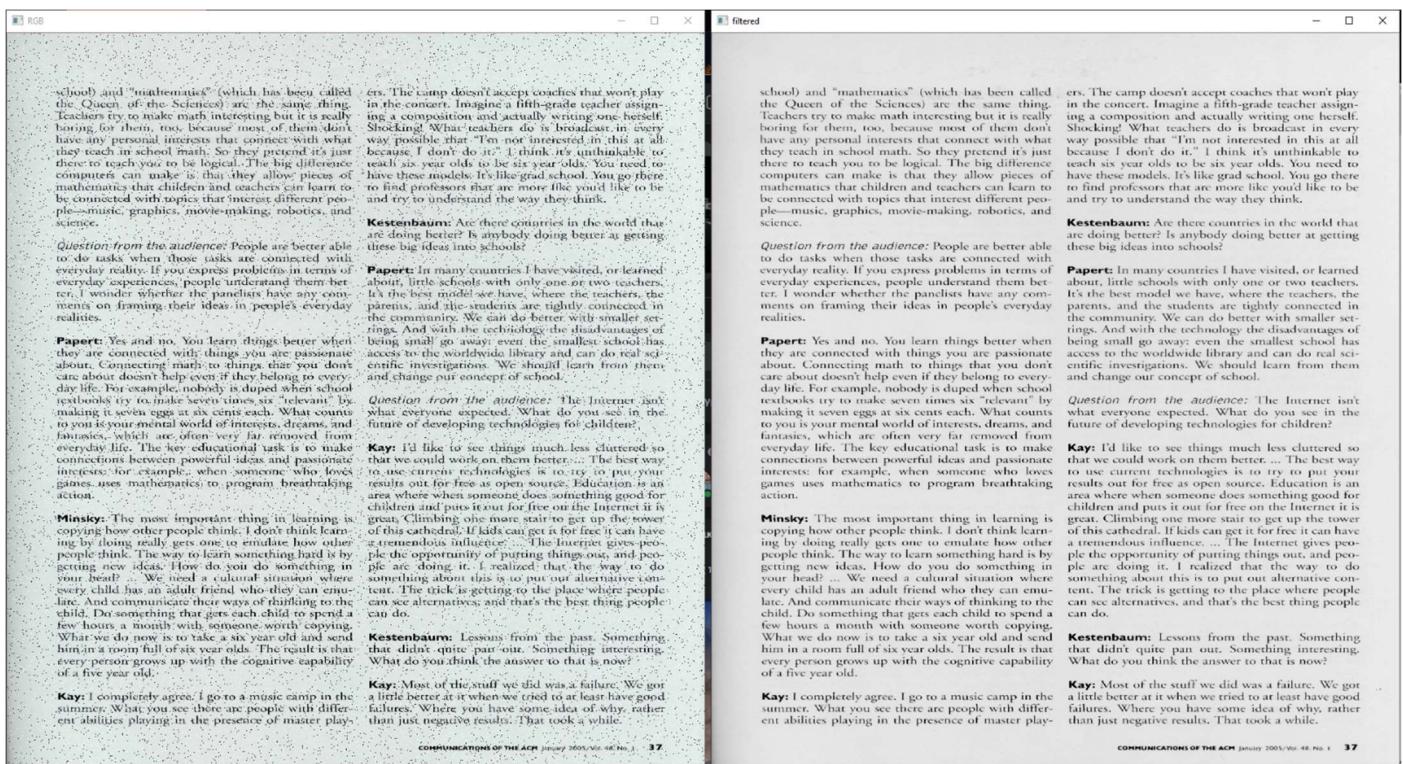
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Εικ.7 Σύγκριση πριν(αριστερά) και μετά(δεξιά) το φίλτράρισμα για την εικόνα 4_original.png



Εικ.8 Σύγκριση πριν(αριστερά) και μετά(δεξιά) το φίλτράρισμα για την εικόνα 4_noise.png

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• The required (prescriptive) and actual (descriptive) content of profiling-related privacy policies and procedures.

• How privacy policies contribute to or detract from the use of profiling to achieve business objectives.

• The degree to which the implementation and operation of profiling procedures coincide with formal, written policies.

Implications of procedural outcomes. Areas of investigation would include:

- The perceptions of consumers regarding the cost of privacy forfeiture through profiling.
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CONCLUSION
A detailed exploration of the ways in which data mining technologies can be used to collect, analyze,

and redistribute data is important not only because of the opportunities to enhance marketing efforts, but also because it sheds light on how consumers and society will react to the technologies—either positively or negatively. From a purely practical perspective, a negative reaction could cause consumers to turn away from the technology, the product, and the company, thus counteracting any marketing improvements delivered by the technology. In that regard, knowledge of consumer and societal perceptions of privacy infringements is as important as knowledge of individual consumer demographics and buying habits. With that knowledge, companies can take measures to anticipate and prevent violations and to compensate consumers in an appropriate manner when a violation of privacy is considered "the cost of doing business."

REFERENCES

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and redistribute data is important not only because of the opportunities to enhance marketing efforts, but also because it sheds light on how consumers and society will react to the technologies—either positively or negatively. From a purely practical perspective, a negative reaction could cause consumers to turn away from the technology, the product, and the company, thus counteracting any marketing improvements delivered by the technology. In that regard, knowledge of consumer and societal perceptions of privacy infringements is as important as knowledge of individual consumer demographics and buying habits. With that knowledge, companies can take measures to anticipate and prevent violations and to compensate consumers in an appropriate manner when a violation of privacy is considered "the cost of doing business."

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Εικ.10 Σύγκριση πριν(αριστερά) και μετά(δεξιά) το φίλτραρισμα για την εικόνα 5_noise.png

Εν κατακλείδι, τα αποτελέσματα είναι πολύ ικανοποιητικά, και μπορεί η εκτέλεση να καθυστερεί, λόγω της χρήσης των 2 loop, όμως το τελικό αποτέλεσμα θεωρώ πως υπερνικά το μειονέκτημα της υλοποίησης.

• Thresholding

Προτού γίνουν οποιεσδήποτε μορφολογικές επεξεργασίες,η εικόνα πρέπει να μετατραπεί σε εικόνα δυαδικής μορφής,για να διαχωριστεί το background με το foreground(λέξεις).Η διαδικασία αυτή επιτυγχάνεται με χρήση της εντολής cv2.threshold.Για να αποφύγω τον ορισμό ενός αυθαίρετου threshold,το οποίο ενδεχομένως δεν θα οδηγούσε στο βέλτιστο αποτέλεσμα,επιλέγω την χρήση της Otsu,που υπολογίζει αυτόματα ένα όριο(threshold),σε συνδυασμό με binary inverted,για να υλοποιήσω στην συνέχεια τις μορφολογικές επεξεργασίες που έχω σκεφτεί. Ο αλγόριθμος του Otsu ξεκινά με ένα αρχικό όριο,(εδώ είναι το 0) και στην συνέχεια ελέγχει όλα τα πιθανά threshold,ώσπου να καταλήξει στο βέλτιστο.Έπειτα, η binary inverted,θέτει την τιμή 0 αν η τιμή του εικονοστοιχείου είναι μεγαλύτερη του ορίου,διαφορετικά θέτει 1,δηλαδή το background θα πάρει τιμή 0,ενώ οι λέξεις την τιμή 255(binary 1).Το 0 αντιστοιχεί στο μαύρο χρώμα,ενώ το 255 στο λευκό.Ακολουθούν τα αποτελέσματα της διαδικασίας.



Εικ.11,12 Εφαρμογή της τεχνικής του threshold στην εικόνα 2_original και 2_noise.png

processes, which interrelates states and maps states to observables. Finally, a reward function is associated with each state.

Constraint-based Trellis Diagram. Mode estimation encodes Probabilistic Hierarchical Constraint Automata (PHCA) as a constraint-based trellis diagram, and searches this diagram in order to estimate the most likely system diagnosis. This encoding is similar in spirit to a SatPlan/Graphplan encoding in planning.

CONCLUSION
We have extended a system capable of diagnosing and reconfiguring redundant hardware systems so that instrumented software systems can likewise be made robust. Software systems lack many of the kinds of constraints found in hardware, which the described methods have traditionally been applied; they tend to be more hierarchical and have more complex and numerous component interactions. Software components and their interconnections represent a significantly higher modeling burden.

Our approach differs from other similar techniques in the following ways:

- Models specify program behavior in terms of abstract states, which simultaneously makes the models easier to read and think about and somewhat robust to changes in low-level software implementation decisions.
- Modeling covers a wide spectrum of software considerations from a high-level storyboard of the software to temporal considerations, if any, to the causal relationships between components.
- Robustness and recovery derives from a collection of fault-tolerant primitives, such as two-phase rollbacks that estimate state, choose contingencies, and plan state trajectories. The programmer is largely shielded from this complexity because the mechanism is hidden behind the intuitive unified modeling language.

An interesting feature of our approach is the ability to add robustness incrementally. More modeling leads to greater runtime robustness because it allows the system to detect, diagnose, and repair more faults in parallel. This means the effort devoted to modeling can be managed in much the same way that is done for test suite development in conventional software development projects.

Modeling errors can result in a number of undesirable outcomes such as failure to detect fault conditions and subsequent failure to recover from the fault.

incorrect diagnosis of the fault, and attributing faults to components that are operating correctly. In this sense an incorrect model is no different from any other bug in the software. It is somewhat easier to deal with, however, because the models are written at a more abstract level than the program itself, making them easier to read. There is a problem with making changes to the software definition and neglecting to update the models of the software, which we expect tools to evolve to address this kind of problem.

The nature of the models developed for a software system vary depending upon the nature of the software itself. Some programs, especially those involved in embedded and robotic applications, have critical timing considerations that must be modeled as such whereas other programs have no timing of synchronization considerations.

Developing model-based reconfigurable software systems is a relatively new endeavor, but results of our early experiments are encouraging. Much work remains to extend the current experimental system to cover the full range of software practice. □

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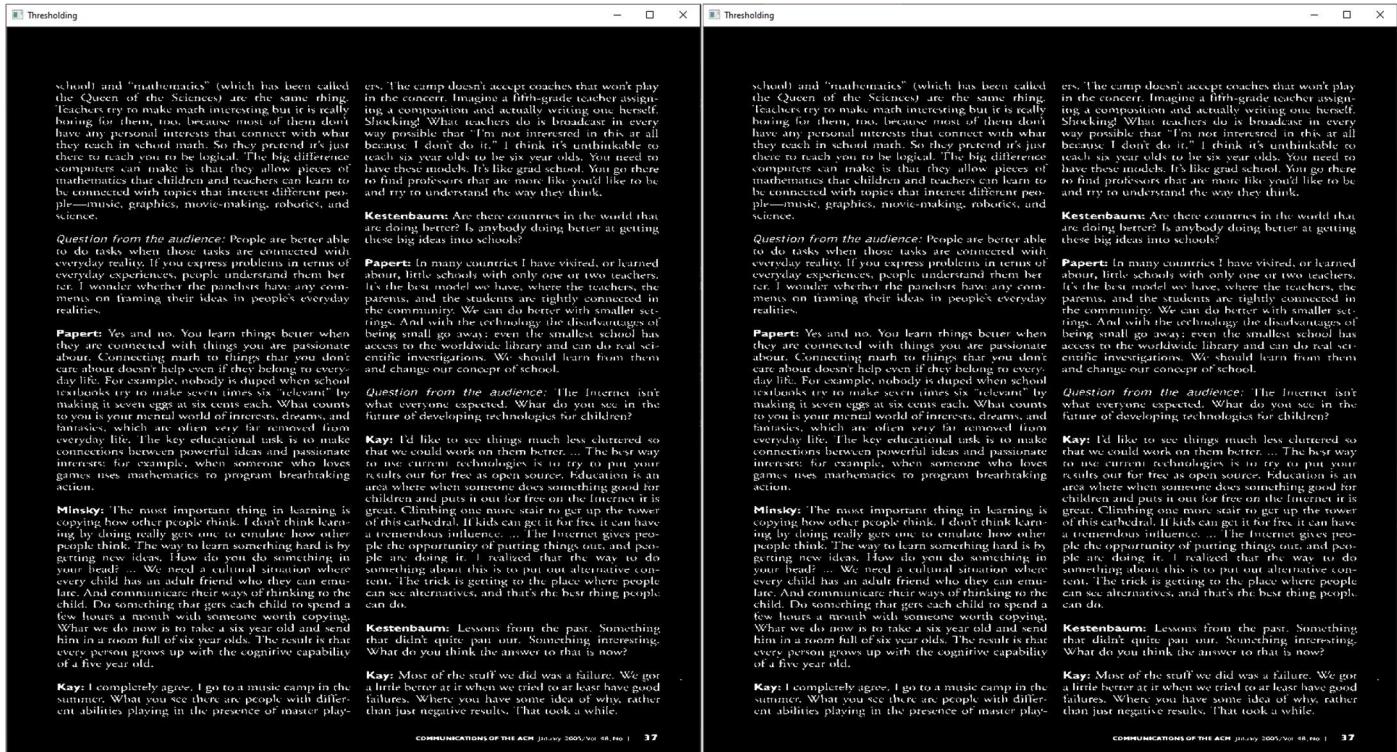
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Εικ.13,14 Εφαρμογή της τεχνικής του threshold στην εικόνα 3_original και 3_noise.png



Εικ.15,16 Εφαρμογή της τεχνικής του threshold στην εικόνα 4_original και 4_noise.png

- The impact of automated consumer profiling on the formulation and implementation of privacy policies.
- Consumer and societal satisfaction with profiling-related privacy policies.
- The required (prescriptive) and actual (descriptive) nature of profiling-related privacy policies and procedures.
- How privacy policies contribute to or detract from the use of profiling to achieve business objectives.
- The extent to which the implementation and operation of profiling procedures coincide with formal, written policies.

Implications of procedural outcomes. Areas of investigation would include:

- The perceptions of consumers regarding the cost of privacy forfeiture through profiling.
- The decision-making processes used by consumers to assess the costs of privacy forfeiture.
- The extent to which the consumer can place a monetary value on their privacy.
- The types and levels of compensation considered appropriate (or not) in return for various types and levels of privacy forfeitures.
- The reactions of consumers to offers of compensation, of various forms, from advertisers and media providers.

Implications of profiling accuracy. Areas of investigation would include:

- The comparative threat to privacy of behavior monitoring (higher certainty) versus consumer profiling (lower certainty).
- The extent to which the level of accuracy impacts an individual's reaction to the privacy infringement. Is a more accurate profile considered more threatening than a less accurate one, or is the simple threat of being a profile considered sufficiently threatening?
- The extent to which the response to behavior monitoring and profiling varies with the individual consumer.
- The factors that impact the consumer's response to behavior monitoring and profiling.
- The economic and competitive implications of pursuing higher levels of accuracy.

CONCLUSION

A detailed exploration of the ways in which data mining technologies can be used to collect, analyze,

and redistribute data is important not only because of the opportunities to enhance marketing efforts, but also because it sheds light on how consumers and society will react to this technology—either positively or negatively. From a practical perspective, companies could use this knowledge to turn away from the negative technology, the product, and the company, thus counteracting any marketing improvements delivered by the technology. In that regard, knowledge of consumer and societal perceptions of privacy infringements is as important as knowledge of consumer and societal needs and buying habits. With that knowledge, companies can take measures to anticipate and prevent violations, and to compensate consumers in an appropriate manner when a violation of privacy is considered "the cost of doing business." ■

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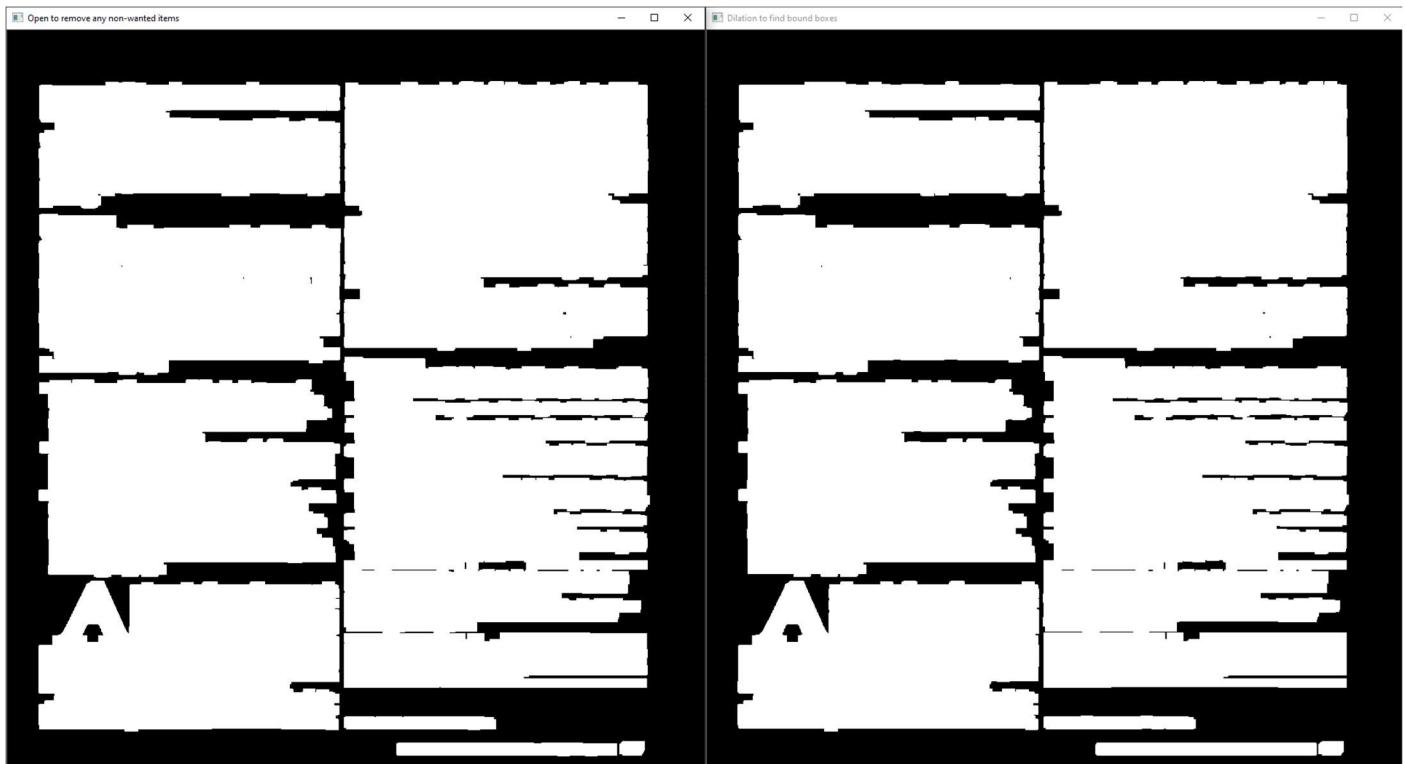
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Εικ.17,18 Εφαρμογή της τεχνικής του threshold στην εικόνα 5_original και 5_noise.png

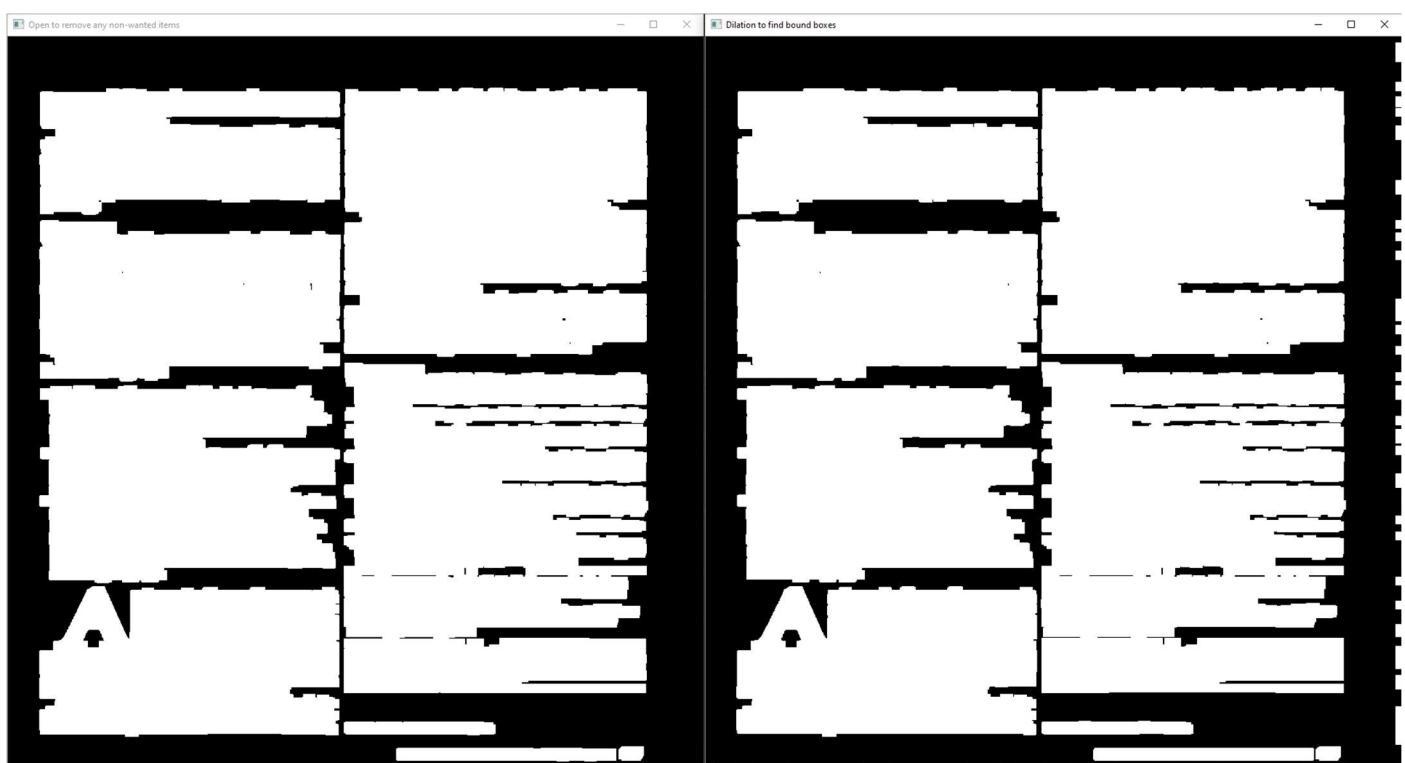
Παρατηρούμε πως το αποτέλεσμα είναι ικανοποιητικό, αφού μπορούμε να διακρίνουμε τα γράμματα σε μεγάλο βαθμό, ασχέτως με την διαβάθμιση του γκρι που είχαν μετά το φιλτράρισμα. Το γεγονός αυτό προκύπτει με την χρήση του αλγορίθμου του Otsu, αφού χρησιμοποιείται η βέλτιστη τιμή ως όριο.

• Μορφολογικές Επεξεργασίες

Αρχικά, πραγματοποιώ διαστολή(dilation), με μεγάλο σχετικά πυρήνα(40x40), προκειμένου να μεγαλώσω κάθε εικονοστοιχείο, ώστε τα εικονοστοιχεία που βρίσκονται κοντά μεταξύ τους(γράμματα, λέξεις, προτάσεις) να ενωθούν μεταξύ τους και να σχηματίσουν μεγάλες περιοχές, οι οποίες λόγω της δυαδικής εικόνας, θα έχουν ίδια τιμή(255, λευκό χρώμα), σε αντίθεση με το περιβάλλον(background) που έχει την τιμή 0(μαύρο χρώμα). Έπειτα, στο αποτέλεσμα της άνωθεν επεξεργασίας, πραγματοποιώ άνοιγμα(opening) με πυρήνα ίδιου μεγέθους, με σκοπό να εξαλείψω όποιο σημείο πέρασε από το φίλτρο και διογκώθηκε λόγω του dilation, για να μην θεωρηθεί ως υποπεριοχή από την υλοποίησή μου, ενώ παράλληλα διατηρώ ανεπηρέαστες τις βασικές περιοχές. Το άνοιγμα, δηλαδή, δεν επιδρά στις βασικές περιοχές, αλλά απομακρύνει επαρκώς περιοχές που διογκώθηκαν λόγω του dilation, στις εικόνες με θόρυβο. Το συμπέρασμα αυτό, γίνεται εύκολα κατανοητό, από τις εξόδους που ακολουθούν, μετά τις προαναφερθείσες επεξεργασίες.



Εικ.19 Εφαρμογή των μορφολογικών επεξεργασιών,dilatation(δεξιά) και open(αριστερά) στην εικόνα 2_original.png



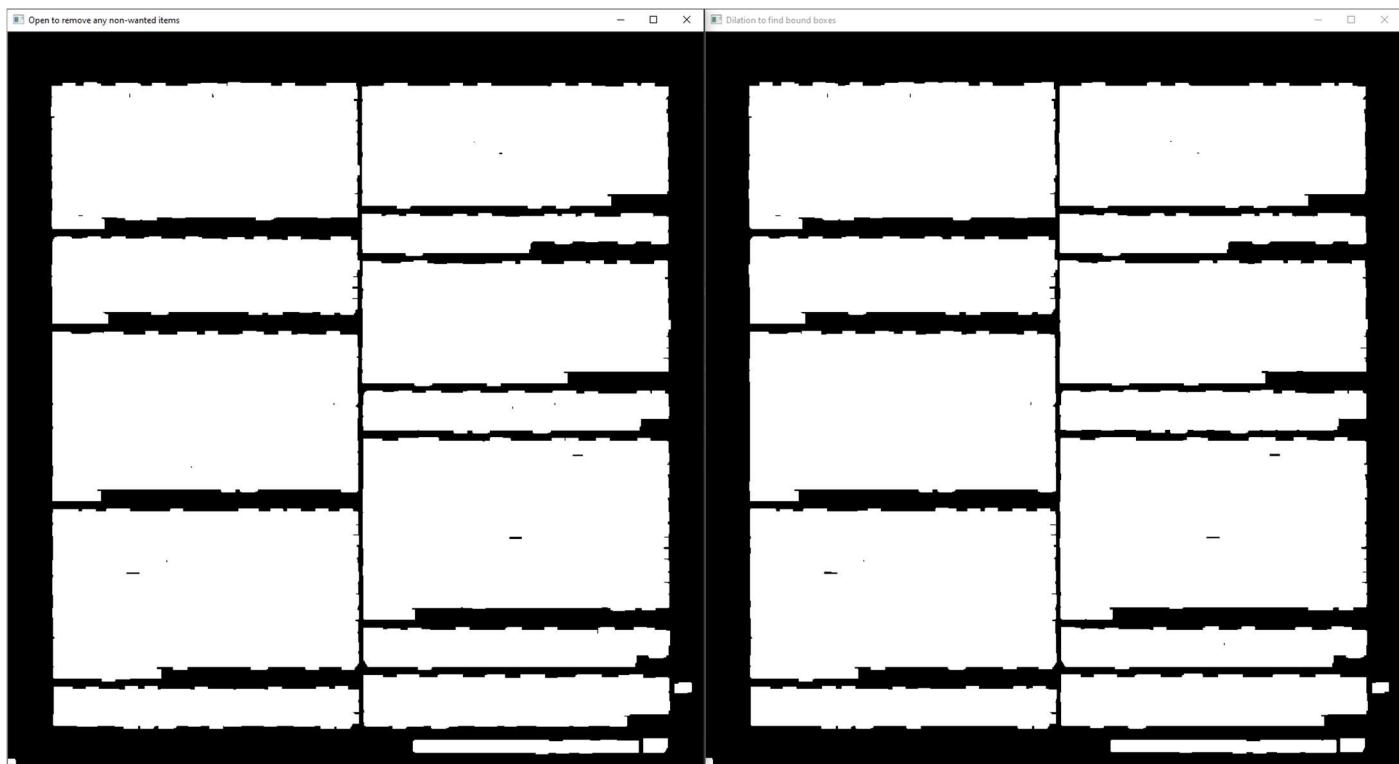
Εικ.20 Εφαρμογή των μορφολογικών επεξεργασιών,dilatation(δεξιά) και open(αριστερά) στην εικόνα 2_noise.png



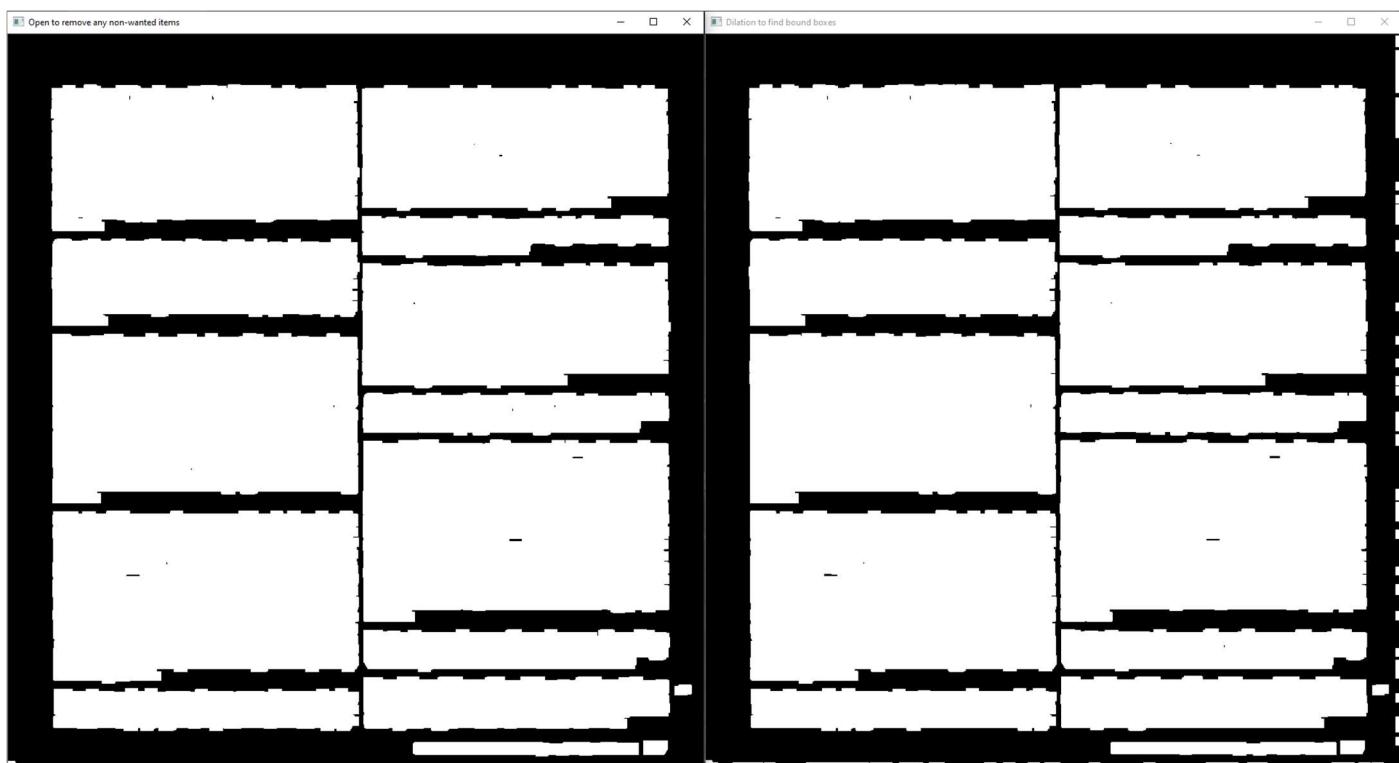
Εικ.21 Εφαρμογή των μορφολογικών επεξεργασιών,dilation(δεξιά) και open(αριστερά) στην εικόνα 3_original.png



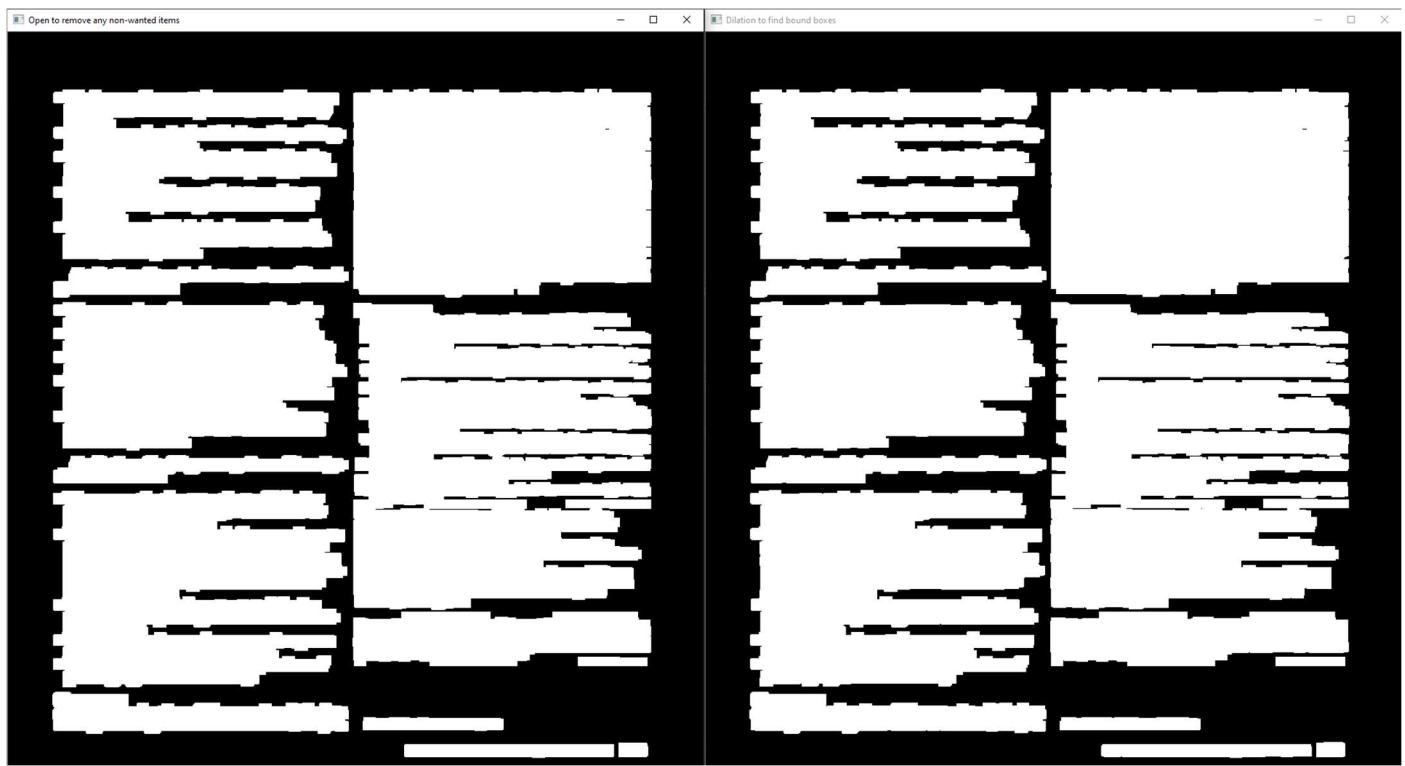
Εικ.22 Εφαρμογή των μορφολογικών επεξεργασιών,dilation(δεξιά) και open(αριστερά) στην εικόνα 3_noise.png



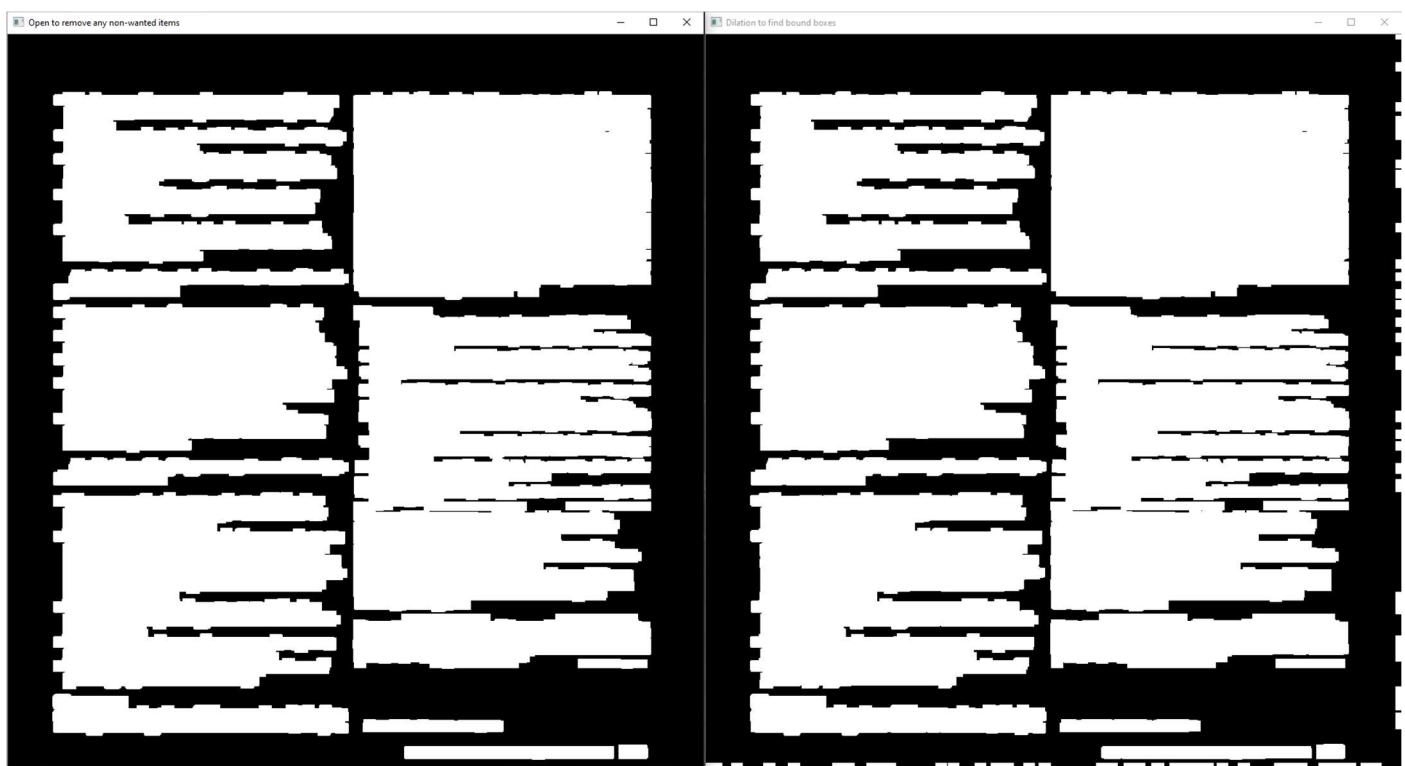
Εικ.23 Εφαρμογή των μορφολογικών επεξεργασιών,dilation(δεξιά) και open(αριστερά) στην εικόνα 4_original.png



Εικ.24 Εφαρμογή των μορφολογικών επεξεργασιών,dilation(δεξιά) και open(αριστερά) στην εικόνα 4_noise.png



Εικ.25 Εφαρμογή των μορφολογικών επεξεργασιών,dilation(δεξιά) και open(αριστερά) στην εικόνα 5_original.png



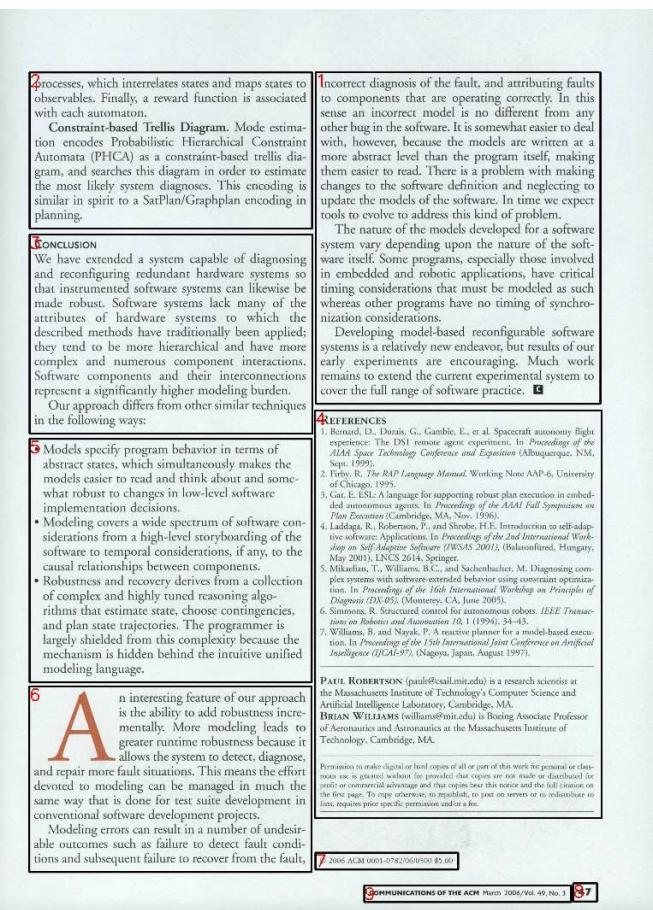
Εικ.26 Εφαρμογή των μορφολογικών επεξεργασιών,dilation(δεξιά) και open(αριστερά) στην εικόνα 5_noise.png

Συμπερασματικά, γίνεται αντιληπτό, ότι στις εικόνες που είχαν κάποια απομεινάρια θορύβου, κυρίως στο περίγραμμα, που διογκώθηκαν από το dilation, αλλά απομακρύνθηκαν σε μεγάλο βαθμό από το open, που ακολούθησε.

• Εύρεση των ορίων κάθε περιοχής

Κατά την μελέτη μου, οδηγήθηκα σε 2 τρόπους, ο υποδεικνυόμενος που τελικά χρησιμοποίησα, και η χρήση της εντολής `findContours` για την εύρεση των περιγραμμάτων (contours). Καθαυτό τον τρόπο, χρησιμοποίησα την εντολή `connectedComponentsWithStats`, η οποία εφαρμόζει τον αλγόριθμο `connected components`. Ο αλγόριθμος διατρέχει τον πίνακα (το αποτέλεσμα της μορφολογικής επεξεργασίας) γραμμή-γραμμή και σε κάθε περιοχή εικονοστοιχείων που είναι συνδεδεμένα μεταξύ τους, δίνει μια ετικέτα (έναν μοναδικό αριθμό) στα εικονοστοιχεία των περιοχών αυτών. Στην συνέχεια, επαναλαμβάνεται η διαδικασία αυτή από τον αλγόριθμο, όμως τώρα γίνεται έλεγχος αν εικονοστοιχεία με διαφορετική ετικέτα γειτνιάζουν, αν ναι, τότε αποκτούν την μικρότερη ετικέτα μεταξύ των γειτονικών εικονοστοιχείων. Οι περιοχές, προέκυψαν από την μορφολογική επεξεργασία που αναλύθηκε στην προηγούμενη ενότητα. Η `connectedComponentsWithStats` επιστρέφει τον αριθμό των ετικετών, και τα στατιστικά αυτών των περιοχών (στην πραγματικότητα επιστρέφει και άλλες δύο παραμέτρους αλλά δεν χρησιμοποιήθηκαν αυτές). Τα στατιστικά, περιέχουν το εμβαδό (σε εικονοστοιχεία) που καταλαμβάνει κάθε περιοχή, την αρχή της, σε 2 συντεταγμένες, στον οριζόντιο (x) και στον κατακόρυφο (y), το ύψος (h) και το πάχος (w) της. Έτσι, με μία επαναληπτική διαδικασία, για κάθε σετ x, y, w, h δημιουργείται ένα παραλληλόγραμμο που περικλείει την κάθε υποπεριοχή, όπως αυτή ορίστηκε στην εκφώνηση της εργασίας. Τέλος, τοποθετώ και έναν μοναδικό αριθμό, ξεκινώντας από το 1 σε κάθε υποπεριοχή, στην αρχή της (x, y).

```
num, _, stats, _ = cv2.connectedComponentsWithStats(morph1)
x = stats[1:, cv2.CC_STAT_LEFT] # 1: to exclude the background, which is labeled 0
y = stats[1:, cv2.CC_STAT_TOP]
w = stats[1:, cv2.CC_STAT_WIDTH]
h = stats[1:, cv2.CC_STAT_HEIGHT]
bdn_area = []
bdn_boxes = []
area = []
endpoint_x = []
endpoint_y = []
words = []
gray_box = []
total_gray = []
mean_gray = []
sums = cv2.integral(gray) # summed area
for i in range(len(x)):
    cv2.rectangle(img, (x[i], y[i]), (x[i]+w[i], y[i]+h[i]), (0, 0, 0), 5)
    cv2.putText(img, '' + str(i+1), (x[i], y[i] + 50), cv2.FONT_HERSHEY_SIMPLEX, 2, (0, 0, 255), 3)
```



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This way is dismal. This is not to say that process changes should not have a positive effect on the financial situation, or that initiatives should not be subject to scrutiny and justification—they should. But equally, sometimes we should do things and be committed to things simply because we know they are the right things to do. Good leaders doing what are

“**Live sponsor.**” Watts Humphrey is right when he asserts that, unless the top people want it, it won’t happen. But what if they do want it, but are unable or unwilling to give it their direct attention? To paraphrase T.S. Eliot: between the executive thought and the practitioner implementation, lies the shadow. There is a need for solid and relatively unequivocal com-

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Assigned authority is important to the effectiveness of the operational sponsor. However, authority that is simply conferred by an organization may not be enough.

4 Positional authority, the power wielded by a person based on his or her position in an organization, can be quite weak in terms

5 If the core goal and purpose of a business is simply to make money, then the organization should be a bank or a casino.

Clearly the right things, consistently and with commitment, operate at a higher ethical level than those in the raw pursuit of more. People respond very positively to this demonstrated ethic and identify with and engage themselves in the success of the initiative.

EXECUTIVE LEADERSHIP
So how does an organization truly demonstrate and operationalize this commitment? Bob Galvin achieved this at Motorola through his personal attention and time, but this is quite rare. Few CEOs seem to have the time available to commit to a small number of high-priority issues (apart from that “making money” one). Or perhaps there are so many pressing issues that it is difficult to focus on just one or two. One thing I have found essential to the success of (particularly) a software process change initiative is to assign an “operational execu-

munication from the leaders. There is a need for demonstrable and clear consistency and commitment. And there is also a need for a way to transfer that authority downward.

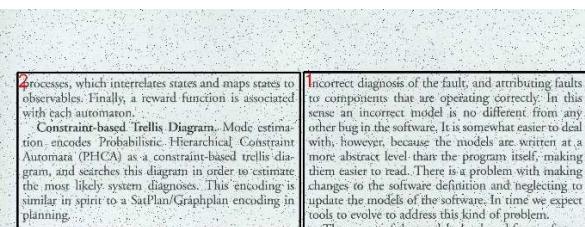
THE OPERATIONAL EXECUTIVE SPONSOR

The mechanism that seems to work best is the assignment of an operational executive sponsor. This is someone in authority who is able to attend to the daily sponsorship needs of the initiative. It must be someone with sufficient authority to be able to rattle a cage or overcome an obstacle when the need arises. It cannot be someone too high up in the organization, if the span of control means that appropriate and continual attention cannot be paid to the process initiative. This person cannot be too low in the organization if that means he or she cannot exert sufficient authority when needed.

of the push necessary to drive a process change, especially if that is the only source of the sponsor’s influence.

• Line authority. It may be helpful if the operational executive sponsor also has line-management duties. When a leader is responsible for a significant production activity their role carries a certain weight with practitioners that a corporate or a staff role may not. Out of the line development, the sponsor might have the conferred authority but might not be able to exert sufficient influence.

• Intellectual authority is the idea or “thought leadership” component. It is very valuable if the operational executive sponsor is a thought leader in the organization and carries authority that is not simply conferred by position. People are more likely to listen to and follow a sponsor when the sponsor’s role is also backed by a certain amount of earned professional respect.



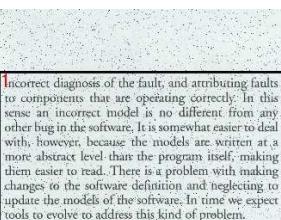
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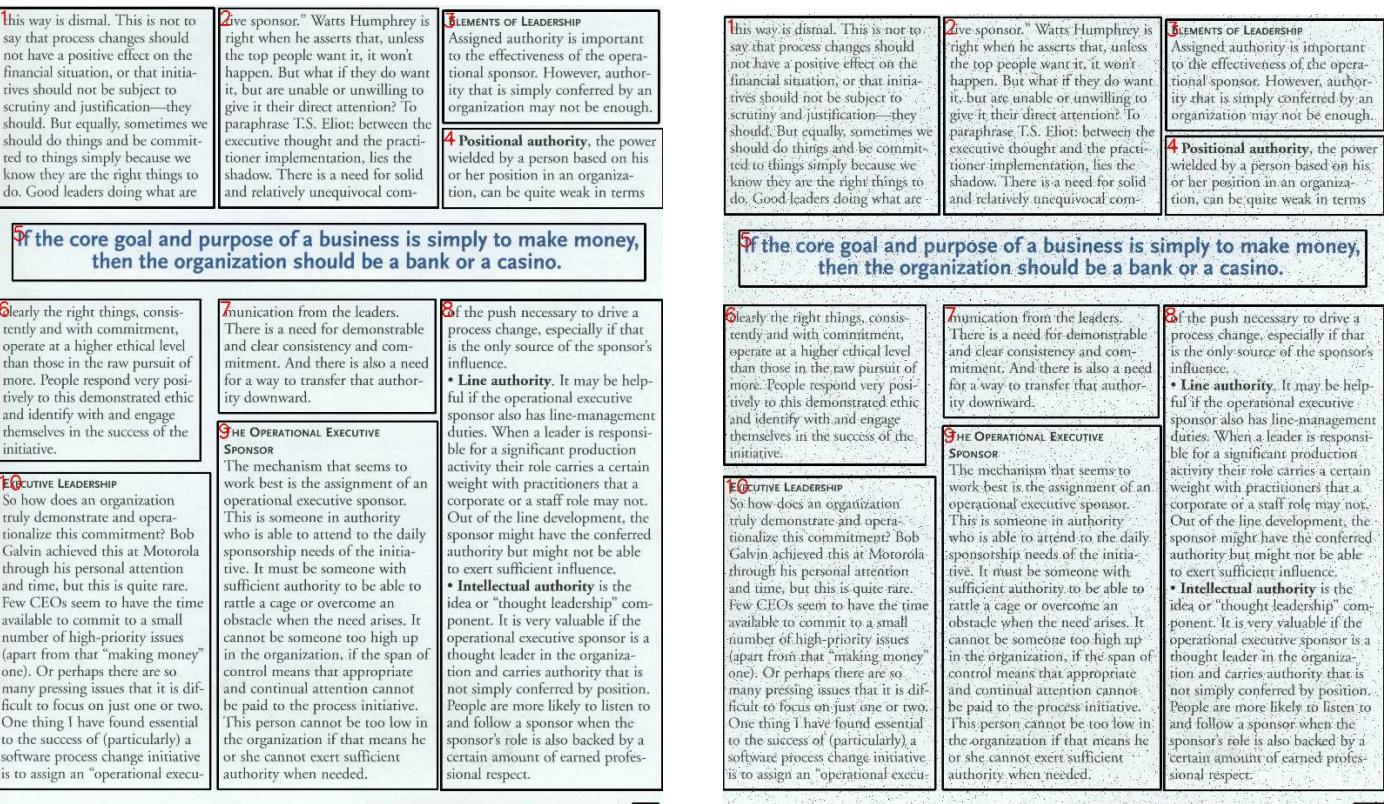
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Εικ.28,29 Έξοδος της υλοποίησης για την εικόνα 2_original και 2_noise.png



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Εικ.30,31 Έξοδος της υλοποίησης για την εικόνα 3_original και 3_noise.png

Kchool) and "mathematics" (which has been called the Queen of the Sciences) are the same thing. Teachers try to make math interesting but it is really boring for them, too, because most of them don't have any personal interests that connect with what they teach in school math. So they pretend it's just there to teach you to be logical. The big difference computers can make is that they allow pieces of mathematics that children and teachers can learn to be connected with topics that interest different people—music, graphics, movie-making, robotics, and science.

Question from the audience: People are better able to do tasks when those tasks are connected with everyday reality. If you express problems in terms of everyday experiences, people understand them better. I wonder whether the panelists have any comments on framing their ideas in people's everyday realities.

Papert: Yes and no. You learn things better when they are connected with things you are passionate about. Connecting math to things that you don't care about doesn't help even if they belong to everyday life. For example, nobody is duped when school textbooks try to make seven times six "relevant" by making it seven eggs at six cents each. What counts to you is your mental world of interests, dreams, and fantasies, which are often very far removed from everyday life. The key educational task is to make connections between powerful ideas and passionate interests: for example, when someone who loves games uses mathematics to program breathtaking action.

Minsky: The most important thing in learning is copying how other people think. I don't think learning by doing really gets one to emulate how other people think. The way to learn something hard is by getting new ideas. How do you do something in your head? ... We need a cultural situation where every child has an adult friend who they can emulate. And communicate their ways of thinking to the child. Do something that gets each child to spend a few hours a month with someone worth copying. What we do now is to take a six year old and send him in a room full of six year olds. The result is that every person grows up with the cognitive capability of a five year old.

Kay: I completely agree. I go to a music camp in the summer. What you see there are people with different abilities playing in the presence of master players.

Kestenbaum: Are there countries in the world that are doing better? Is anybody doing better at getting these big ideas into schools?

Papert: In many countries I have visited, or learned about little schools with only one or two teachers. It's the best model we have, where the teachers, the parents, and the students are tightly connected in the community. We can do better with smaller settings. And with the technology the disadvantages of being small go away; even the smallest school has access to the worldwide library and can do real scientific investigations. We should learn from them, and change our concept of school.

Question from the audience: The Internet isn't what everyone expected. What do you see in the future of developing technologies for children?

Kay: I'd like to see things much less cluttered so that we could work on them better. ... The best way to use current technologies is to try to put your results out for free as open source. Education is an area where when someone does something good for children and puts it out for free on the Internet it is great. Climbing one more stair to get up the tower of this cathedral. If kids can get it for free it can have a tremendous influence. ... The Internet gives people the opportunity of putting things out, and people are doing it. I realized that the way to do something about this is to put out alternative content. The trick is getting to the place where people can see alternatives, and that's the best thing people can do.

Kestenbaum: Lessons from the past. Something that didn't quite pan out. Something interesting. What do you think the answer to that is now?

Kay: Most of the stuff we did was a failure. We got a little better at it when we tried to at least have good failures. Where you have some idea of why, rather than just negative results. That took a while.

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EIK.32,33 Έξοδος της υλοποίησης για την εικόνα 4_original και 4_noise.png

1 The impact of automated consumer profiling on the formulation and implementation of privacy policies.

- Consumer and societal satisfaction with profiling-related privacy policies.
- The required (prescriptive) and actual (descriptive) content of profiling-related privacy policies and procedures.
- How privacy policies contribute to or detract from the use of profiling to achieve business objectives.
- The degree to which the implementation and operation of profiling procedures coincide with formal, written policies.

3 Implications of procedural outcomes. Areas of investigation would include:

4 The perceptions of consumers regarding the cost of privacy forfeiture through profiling.

- The decision-making processes used by consumers to assess the costs of privacy forfeiture.
- The extent to which the consumer can place a monetary value on the cost of privacy forfeiture.
- The types and levels of compensation considered appropriate (or not) in return for various types and levels of privacy forfeitures.
- The reactions of consumers to offers of compensation, of various forms, from advertisers and media providers.

6 Implications of profiling accuracy. Areas of investigation would include:

7 The comparative threat to privacy of behavior monitoring (higher certainty) versus consumer profiling (lower certainty).

- The extent to which the level of accuracy impacts an individual's reaction to the privacy infringement. Is a more accurate profile considered more threatening than a less accurate one, or is the simple attempt to build a profile considered sufficiently threatening?
- The extent to which the response to behavior monitoring and profiling varies with the individual consumer.
- The factors that impact the consumer's response to behavior monitoring and profiling.
- The economic and competitive implications of pursuing higher levels of accuracy.

10 CONCLUSION

A detailed exploration of the ways in which data mining technologies can be used to collect, analyze,

2 and redistribute data is important not only because of the opportunities to enhance marketing efforts, but also because it sheds light on how consumers and society will react to the technologies—either positively or negatively. From a purely practical perspective, a negative reaction could cause consumers to turn away from the technology, the product, and the company, thus counteracting any marketing improvements delivered by the technology. In that regard, knowledge of consumer and societal perceptions of privacy infringements is as important as knowledge of individual consumer demographics and buying habits. With that knowledge, companies can take measures to anticipate and prevent violations, and to compensate consumers in an appropriate manner when a violation of privacy is considered "the cost of doing business."

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A detailed exploration of the ways in which data mining technologies can be used to collect, analyze,

EIK.34,35 Έξοδος της υλοποίησης για την εικόνα 5_original και 5_noise.png

Η υλοποίηση είναι αρκετά εύστοχη, με εξαίρεση το σετ των εικόνων 4 και 5. Από πλευρά απόδοσης, η διαδικασία έχει:

1. 100% επιτυχία για τα σετ 2,3(όπου σετ το σύνολο των εικόνων με ίδιο αριθμό)
2. Για τις εικόνες 4_original και 4_noise εμφανίζει 2 παραπάνω υποπεριοχές (#12,#16). Πρώτον, υπάρχει ένα σημάδι (που υπάρχει και στην original εικόνα, χωρίς τον θόρυβο) στο κάτω δεξιά μέρος της εικόνας, το οποίο δεν θεωρείται θόρυβος από το φίλτρο και παραμένει, με αποτέλεσμα η υλοποίηση να το λογίζει ως υποπεριοχή. Δεύτερον, στο κάτω αριστερά μέρος, υπάρχει ένα μικρό σημείο το οποίο ξεφεύγει από το φίλτρο, και στην συνέχεια παρόλο που η 2η μορφολογική επεξεργασία εξαφανίζει τα μη επιθυμητά σημάδια, αυτή παραμένει και λογίζεται ως υποπεριοχή.
3. Για τις εικόνες 5_original και 5_noise 1 παραπάνω υποπεριοχή (#9), που οφείλεται σε μια μικρή γραμμοσκίαση κάτω δεξιά, μέσα στην υποπεριοχή 8, η οποία δεν διογκώνεται αρκετά για να θεωρηθεί μέλος της υποπεριοχής #8.

Επομένως, παρόλο που υπάρχουν οι παραπάνω αστοχίες, το γεγονός ότι οι παραπανήσιες υποπεριοχές εμφανίζονται και στις καθαρές και στις εν θόρυβο εικόνες, σημαίνει πως οφείλονται σε σημάδια των αρχικών εικόνων τα οποία δεν απομακρύνθηκαν από την υλοποίηση που αναλύθηκε προηγουμένως. Παρόλα αυτά, θεωρώ πως τα αποτελέσματα κρίνονται επιτυχή. Τα παραπάνω προβλήματα ενδεχομένως να μπορούσαν να αποφευχθούν με παραπάνω μορφολογικές διαδικασίες, διαφορετικό μέγεθος πυρήνα για αυτές ή εντελώς διαφορετικό φίλτρο και υλοποίηση. Ωστόσο, σε περίπτωση αλλαγών, χάνεται η ευστοχία που υπάρχει για τα 2 πρώτα σετ, και η σχετικά καλή ευστοχία στα υπόλοιπα σετ, οπότε επέλεξα να κρατήσω την υλοποίηση όπως αυτή παραδόθηκε.

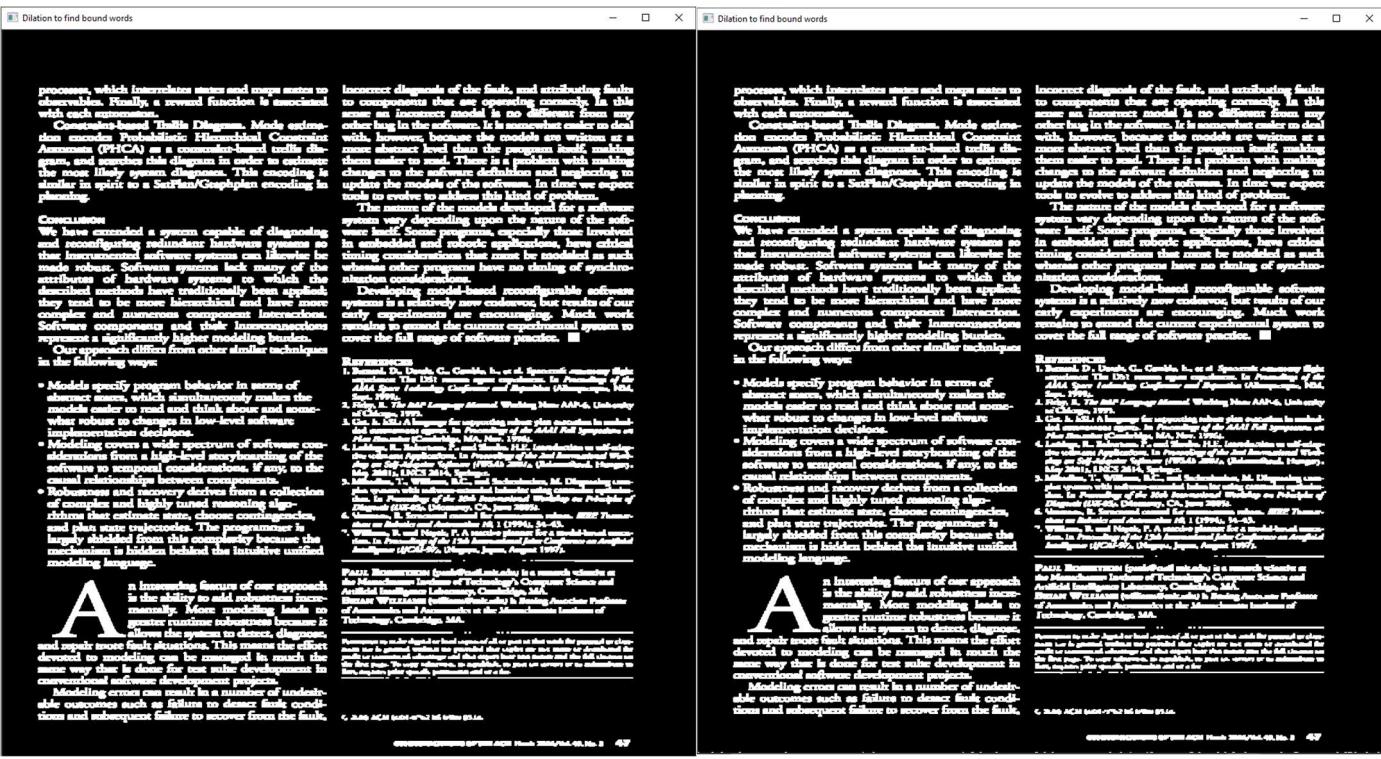
• **Εύρεση των υπόλοιπων χαρακτηριστικών**

```
endpoint_x.insert(i, x[i]+w[i])
endpoint_y.insert(i, y[i]+h[i])
bdn_boxes.insert(i, bin2[y[i]:endpoint_y[i], x[i]:endpoint_x[i]])#crop binary img according to boundary boxes
nums, _, _ = cv2.connectedComponentsWithStats(morph2[y[i]:endpoint_y[i], x[i]:endpoint_x[i]])#connectedComp to find num of labels,i.e. words
words.insert(i, nums-1)#minus-1 cause background gets a label too
area.insert(i, cv2.countNonZero(bdn_boxes[i]))#finding which pixels have non zero value,due to bin inv
bdn_area.insert(i, w[i] * h[i])#total box area
gray_box.insert(i, gray[y[i]:endpoint_y[i], x[i]:endpoint_x[i]])#crop grayscale img according to boundary boxes,to find mean gray value
total_gray.insert(i,(w[i]*h[i]))
mean_gray.insert(i,(sums[total_gray[i]]/(bdn_area[i])))#mean gray for each sub-area
print('Square for area ' + str(i+1), ' is ' + str(bdn_area[i]),' pixels, while text area is '+str(area[i]),
      'pixels,word approximated count is ' +str(words[i]),'and mean gray value is ' +str(mean_gray[i]))
```

Εικ.36 Η υλοποίηση για τα υπόλοιπα ερωτήματα.

Η επιφάνεια του κάθε κουτιού υπολογίζεται πολλαπλασιάζοντας το ύψος και το πάχος κάθε περιοχής, που στην συνέχεια αποθηκεύονται στην λίστα bdn_area.

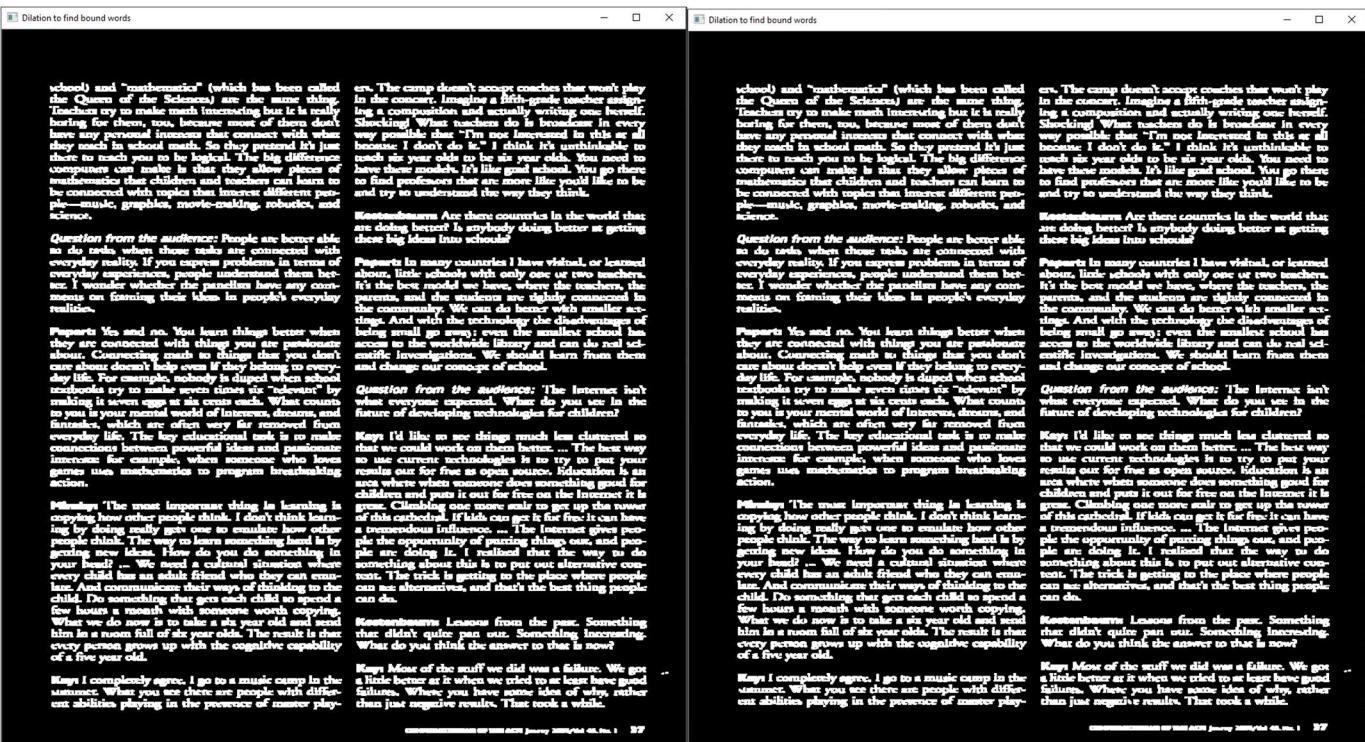
Για τον υπολογισμό των υπολοίπων στοιχείων, κράτησα τις διαστάσεις του κάθε κουτιού σε μια λίστα(bdn_boxes) και τις εφάρμοσα στις εικόνες που προκύπτουν μετά το thresholding για να απομονώσω την κάθε περιοχή και να κάνω τους υπολογισμούς σε αυτές, και μετά το 2^o dilation για να βρω το πλήθος των λέξεων σε κάθε υποπεριοχή. Επέλεξα αυτή την μέθοδο διότι είναι πιο γρήγορη, αφού χρειάζεται μία for-loop. Για την εύρεση της περιοχής που καταλαμβάνεται από τα γράμματα, αρκεί να υπολογίζουμε τα στοιχεία που είναι μη μηδενικά, δηλαδή έχουν την τιμή 255(λευκό χρώμα), σε κάθε απομονωμένη υποπεριοχή. Το πλήθος τους είναι ίσο με το εμβαδό που καταλαμβάνουν, και τα αποτελέσματα για κάθε υποπεριοχή αποθηκεύονται στην λίστα area. Για την εύρεση των λέξεων, απαιτείται ένα dilation με εμφανώς μικρότερο πυρήνα(7x7), αλλά αρκετά μεγάλο, ώστε να ενώνει τα γράμματα της κάθε λέξης. Έτσι, μετά την υλοποίηση της αντίστοιχης μορφολογικής επεξεργασίας, χρησιμοποιώ και πάλι την connectedComponentsWithStats στην binary εικόνα, διότι αν το έκανα στην dilated, θα μετρούσα παραπάνω εικονοστοιχία, αφού θα ήταν διογκωμένα. Επομένως η λογική είναι ότι τώρα, κάθε συνδεδεμένη περιοχή αποτελεί μία λέξη. Άρα ο αριθμός των περιοχών(άρα και των ετικετών) είναι ο αριθμός των λέξεων. Αν η διαδικασία αυτή πραγματοποιηθεί για κάθε απομονωμένη υποπεριοχή της αρχικής εικόνας, θα μας δώσει τον αριθμό των λέξεων σε κάθε υποπεριοχή, που αποθηκεύεται στην λίστα words. Από την παραπάνω περιγραφή, εύλογα βγαίνει το συμπέρασμα ότι το πλήθος των λέξεων που υπολογίζονται, εξαρτάται άμεσα από το μέγεθος του πυρήνα στην μορφολογική επεξεργασία που υπόκεινται οι υποπεριοχές. Τέλος, για το τελευταίο ζητούμενο, εφάρμοσα την προηγούμενη ιδέα στην grayscale εικόνα, και εφάρμοσα σε αυτές την μέθοδο Summed Area Table(ή Integral Image). Σύμφωνα με την Summed Area Table, κάθε τιμή ενός εικονοστοιχείου προκύπτει από το άθροισμα της τιμής του ίδιου εικονοστοιχείου, της τιμής του αμέσως προηγούμενου κατά την οριζόντια κατεύθυνση και της τιμής του αμέσως προηγούμενου κατά την κατακόρυφη κατεύθυνση, αφαιρόντας από αυτό το άθροισμα την τιμή του ακριβώς διαγώνιου προς τα πάνω-αριστερά. Επομένως, προοδευτικά προκύπτει ότι το τελευταίο στοιχείο του πίνακα αυτού, θα αντιστοιχεί στο τελευταίο εικονοστοιχείο της κάθε υποπεριοχής, με την τιμή του να είναι ίση με το άθροισμα όλων των διαβαθμίσων του γκρι. Άρα, αν διαιρέσουμε με το εμβαδό κάθε υποπεριοχής, το αποτέλεσμα θα είναι η μέση τιμή της διαβάθμισης του γκρι κάθε υποπεριοχής. Η διαδικασία αυτή επαναλαμβάνεται για κάθε υποπεριοχή, ενώ τα εμβαδά των υποπεριοχών έχουν ήδη υπολογιστεί. Τέλος, οι μέσες τιμές αποθηκεύονται στην λίστα mean_gray.



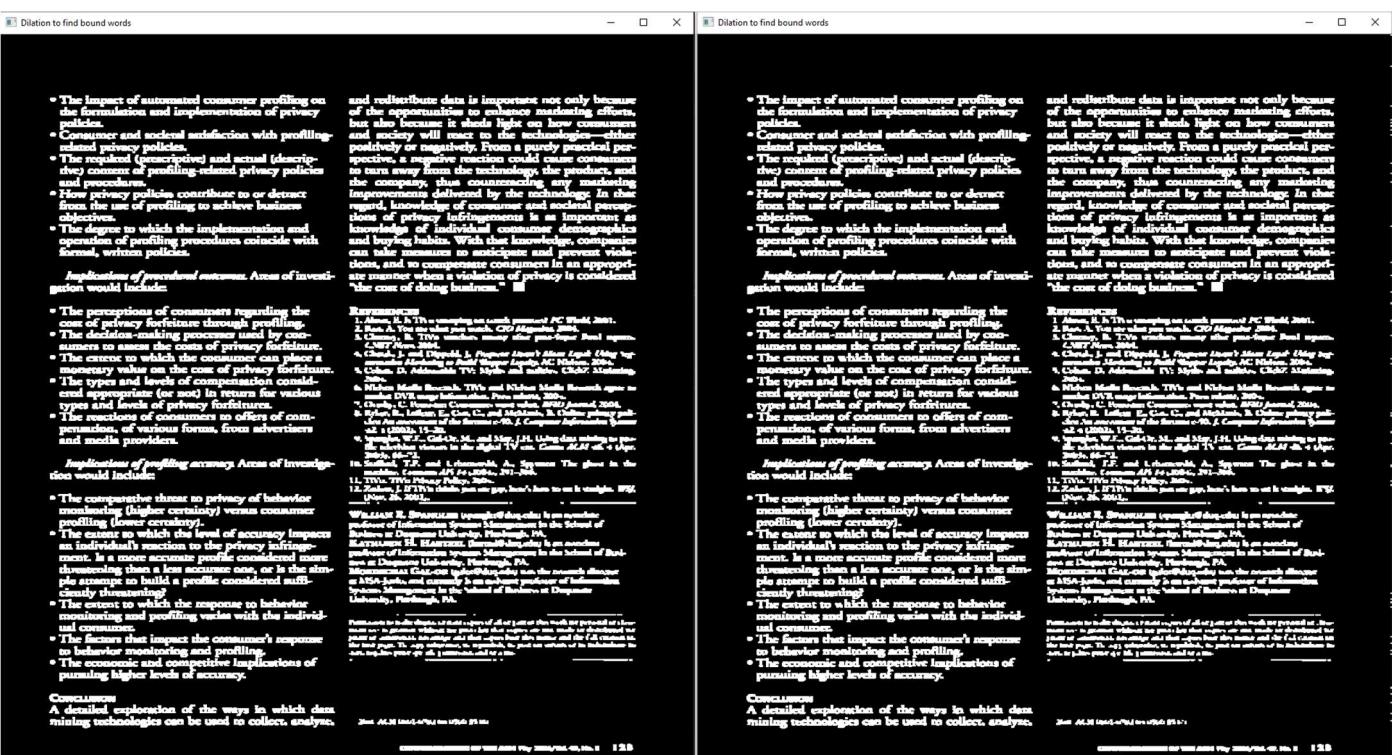
Eik.37,38 Dilation για την εύρεση λέξεων των εικόνων 2_original και 2_noise.png



Eik.39,40 Dilation για την εύρεση λέξεων των εικόνων 3_original και 3_noise.png



Eik.41,42 Dilation για την εύρεση λέξεων των εικόνων 4_original και 4_noise.png



Eik.43,44 Dilation για την εύρεση λέξεων των εικόνων 5_original και 5_noise.png

Το πρόβλημα που αντιμετώπισα ήταν στον υπολογισμό των λέξεων, αλλά δεν ήταν καταστροφικό. Συγκεκριμένα, μερικές φορές λογίζονταν σαν λέξεις κουκκίδες που βρίσκονταν στις πραγματικές λέξεις, όπως για παράδειγμα στο γράμμα "i", ή αν υπήρχε κάποια σειρά που περιείχε σημεία στις οποίες, αυτά διογκώνονταν κατά το dilation οπότε συνένωνταν τις λέξεις που διαχώριζαν σε μία περιοχή. Κατέληξα στο συμπέρασμα, πως στις μικρές υποπεριοχές, λόγω του dilation, ενδεχομένως να χάνονται κάποιες λέξεις, ενώ σε μεγάλες περιοχές, εμφανίζονται παραπάνω λέξεις. Επίσης, σε περίπτωση που ξεφύγει

κάποιο σημείο εντός των ορίων από την διαδικασία φιλτραρίσματος και thresholding και διογκωθεί αρκετά κατά την μορφολογική επεξεργασία, μπορεί να θεωρηθεί λέξη, αν και δεν αντιμετώπισα αυτό το πρόβλημα. Τα προβλήματα αυτά θα μπορούσαν να επιλυθούν με διαφορετικό πυρήνα ή διαφορετικές μορφολογικές διεργασίες, αλλά δεν το επέλεξα, διότι έκρινα το τελικό αποτέλεσμα ικανοποιητικό και μια πολύ καλή προσέγγιση, παρόλο που περιέχει κάποιες ατέλειες. Ακολουθούν τα αποτελέσματα για κάθε εικόνα, στην έξοδο του προγράμματος PyCharm.

```
Square for area 1 is 1201760 pixels, while text area is 162207 pixels, word approximated count is 207 and mean gray value is 225.24943249900147
Square for area 2 is 560899 pixels, while text area is 66743 pixels, word approximated count is 85 and mean gray value is 225.86683342277308
Square for area 3 is 715680 pixels, while text area is 83412 pixels, word approximated count is 102 and mean gray value is 225.51962050078248
Square for area 4 is 1485988 pixels, while text area is 147306 pixels, word approximated count is 343 and mean gray value is 224.07107325227392
Square for area 5 is 874214 pixels, while text area is 99929 pixels, word approximated count is 143 and mean gray value is 225.10095468615236
Square for area 6 is 665972 pixels, while text area is 88153 pixels, word approximated count is 111 and mean gray value is 225.67443225841328
Square for area 7 is 30540 pixels, while text area is 1816 pixels, word approximated count is 8 and mean gray value is 226.68690242305175
Square for area 8 is 5525 pixels, while text area is 628 pixels, word approximated count is 1 and mean gray value is 226.98135746606334
Square for area 9 is 43542 pixels, while text area is 5805 pixels, word approximated count is 9 and mean gray value is 226.69900326121905
```

Εικ.45 Αποτελέσματα για την εικόνα 2_original.png

```
Square for area 1 is 1201760 pixels, while text area is 161582 pixels, word approximated count is 209 and mean gray value is 225.31916272799893
Square for area 2 is 560899 pixels, while text area is 66475 pixels, word approximated count is 86 and mean gray value is 225.9475003521133
Square for area 3 is 716688 pixels, while text area is 82975 pixels, word approximated count is 103 and mean gray value is 225.60371877302256
Square for area 4 is 1485555 pixels, while text area is 144974 pixels, word approximated count is 353 and mean gray value is 224.12291702427711
Square for area 5 is 874214 pixels, while text area is 99217 pixels, word approximated count is 146 and mean gray value is 225.17739134811384
Square for area 6 is 665972 pixels, while text area is 87676 pixels, word approximated count is 111 and mean gray value is 225.7585153730187
Square for area 7 is 30540 pixels, while text area is 1773 pixels, word approximated count is 8 and mean gray value is 226.68726260641782
Square for area 8 is 5525 pixels, while text area is 628 pixels, word approximated count is 1 and mean gray value is 226.98425339366517
Square for area 9 is 43601 pixels, while text area is 5765 pixels, word approximated count is 9 and mean gray value is 226.7017289511707
```

Εικ.46 Αποτελέσματα για την εικόνα 2_noise.png

```
Square for area 1 is 402549 pixels, while text area is 46492 pixels, word approximated count is 90 and mean gray value is 222.211042630835
Square for area 2 is 406752 pixels, while text area is 48432 pixels, word approximated count is 92 and mean gray value is 222.4153587443946
Square for area 3 is 225378 pixels, while text area is 26752 pixels, word approximated count is 40 and mean gray value is 221.8444568680173
Square for area 4 is 162866 pixels, while text area is 19220 pixels, word approximated count is 35 and mean gray value is 222.01030908845308
Square for area 5 is 334236 pixels, while text area is 57589 pixels, word approximated count is 36 and mean gray value is 222.01496547349777
Square for area 6 is 305532 pixels, while text area is 34377 pixels, word approximated count is 63 and mean gray value is 220.60050993022008
Square for area 7 is 229052 pixels, while text area is 23129 pixels, word approximated count is 39 and mean gray value is 221.92955748039748
Square for area 8 is 1009125 pixels, while text area is 122867 pixels, word approximated count is 200 and mean gray value is 224.0286287625418
Square for area 9 is 752862 pixels, while text area is 84909 pixels, word approximated count is 150 and mean gray value is 223.5328413440976
Square for area 10 is 631110 pixels, while text area is 74031 pixels, word approximated count is 135 and mean gray value is 223.33343315745273
Square for area 11 is 3713 pixels, while text area is 446 pixels, word approximated count is 2 and mean gray value is 227.11069216267168
Square for area 12 is 17630 pixels, while text area is 3855 pixels, word approximated count is 4 and mean gray value is 227.50124787294385
Square for area 13 is 12948 pixels, while text area is 1653 pixels, word approximated count is 5 and mean gray value is 229.209453197405
```

Εικ.47 Αποτελέσματα για την εικόνα 3_original.png

```
Square for area 1 is 402549 pixels, while text area is 46210 pixels, word approximated count is 91 and mean gray value is 222.3082730301156
Square for area 2 is 406752 pixels, while text area is 48159 pixels, word approximated count is 93 and mean gray value is 222.5117688419479
Square for area 3 is 229824 pixels, while text area is 26545 pixels, word approximated count is 45 and mean gray value is 222.29887218045113
Square for area 4 is 162866 pixels, while text area is 19102 pixels, word approximated count is 39 and mean gray value is 222.1080704382744
Square for area 5 is 334236 pixels, while text area is 57560 pixels, word approximated count is 36 and mean gray value is 222.12286528081955
Square for area 6 is 305532 pixels, while text area is 34113 pixels, word approximated count is 64 and mean gray value is 220.70669520704868
Square for area 7 is 229052 pixels, while text area is 23078 pixels, word approximated count is 40 and mean gray value is 222.02596790248504
Square for area 8 is 1013610 pixels, while text area is 121922 pixels, word approximated count is 218 and mean gray value is 224.19433213958033
Square for area 9 is 753984 pixels, while text area is 84280 pixels, word approximated count is 149 and mean gray value is 223.6639822595705
Square for area 10 is 631110 pixels, while text area is 73433 pixels, word approximated count is 136 and mean gray value is 223.426965188319
Square for area 11 is 4371 pixels, while text area is 447 pixels, word approximated count is 4 and mean gray value is 228.57332418210936
Square for area 12 is 17630 pixels, while text area is 3844 pixels, word approximated count is 6 and mean gray value is 227.5770845150312
Square for area 13 is 12948 pixels, while text area is 1636 pixels, word approximated count is 6 and mean gray value is 229.2220420142107
```

Εικ.48 Αποτελέσματα για την εικόνα 3_noise.png

```

Square for area 1 is 652536 pixels, while text area is 64651 pixels,word approximated count is 138 and mean gray value is 214.4488871112092
Square for area 2 is 556665 pixels, while text area is 57488 pixels,word approximated count is 135 and mean gray value is 214.74106688942183
Square for area 3 is 190380 pixels, while text area is 17126 pixels,word approximated count is 35 and mean gray value is 217.75938123752496
Square for area 4 is 388702 pixels, while text area is 36165 pixels,word approximated count is 74 and mean gray value is 215.45757675545792
Square for area 5 is 556871 pixels, while text area is 56611 pixels,word approximated count is 128 and mean gray value is 214.72619511520622
Square for area 6 is 751751 pixels, while text area is 77617 pixels,word approximated count is 164 and mean gray value is 214.36657882729787
Square for area 7 is 190380 pixels, while text area is 17255 pixels,word approximated count is 38 and mean gray value is 217.75938123752496
Square for area 8 is 805409 pixels, while text area is 81086 pixels,word approximated count is 228 and mean gray value is 214.14589481865735
Square for area 9 is 765528 pixels, while text area is 80802 pixels,word approximated count is 185 and mean gray value is 214.28917035039868
Square for area 10 is 189189 pixels, while text area is 18538 pixels,word approximated count is 35 and mean gray value is 217.83616383616385
Square for area 11 is 243729 pixels, while text area is 23274 pixels,word approximated count is 62 and mean gray value is 216.65930603251974
Square for area 12 is 2632 pixels, while text area is 22 pixels,word approximated count is 2 and mean gray value is 210.2644376899696
Square for area 13 is 189810 pixels, while text area is 18460 pixels,word approximated count is 42 and mean gray value is 217.77300985195723
Square for area 14 is 5184 pixels, while text area is 519 pixels,word approximated count is 2 and mean gray value is 212.1454475308642
Square for area 15 is 46494 pixels, while text area is 5141 pixels,word approximated count is 9 and mean gray value is 213.17348475072052
Square for area 16 is 675 pixels, while text area is 24 pixels,word approximated count is 1 and mean gray value is 207.95703703703703

```

Εικ.49 Αποτελέσματα για την εικόνα 4_original.png

```

Square for area 1 is 652536 pixels, while text area is 64155 pixels,word approximated count is 139 and mean gray value is 214.50970980911399
Square for area 2 is 556665 pixels, while text area is 56991 pixels,word approximated count is 136 and mean gray value is 214.8117548435772
Square for area 3 is 190380 pixels, while text area is 17042 pixels,word approximated count is 36 and mean gray value is 217.76937703540287
Square for area 4 is 388702 pixels, while text area is 35866 pixels,word approximated count is 74 and mean gray value is 215.52207346501947
Square for area 5 is 557878 pixels, while text area is 56172 pixels,word approximated count is 132 and mean gray value is 214.7889610273214
Square for area 6 is 751751 pixels, while text area is 76984 pixels,word approximated count is 166 and mean gray value is 214.43478891281822
Square for area 7 is 190380 pixels, while text area is 17104 pixels,word approximated count is 38 and mean gray value is 217.76937703540287
Square for area 8 is 805409 pixels, while text area is 80460 pixels,word approximated count is 230 and mean gray value is 214.21911476032673
Square for area 9 is 765528 pixels, while text area is 80277 pixels,word approximated count is 189 and mean gray value is 214.35945909228664
Square for area 10 is 189189 pixels, while text area is 18418 pixels,word approximated count is 35 and mean gray value is 217.845952745667
Square for area 11 is 243729 pixels, while text area is 23033 pixels,word approximated count is 63 and mean gray value is 216.68474822446242
Square for area 12 is 2632 pixels, while text area is 22 pixels,word approximated count is 2 and mean gray value is 210.286694224924
Square for area 13 is 189810 pixels, while text area is 18339 pixels,word approximated count is 42 and mean gray value is 217.78322006216743
Square for area 14 is 5184 pixels, while text area is 518 pixels,word approximated count is 2 and mean gray value is 212.15663580246914
Square for area 15 is 46494 pixels, while text area is 5134 pixels,word approximated count is 9 and mean gray value is 213.1733341936594
Square for area 16 is 675 pixels, while text area is 18 pixels,word approximated count is 2 and mean gray value is 208.031111111111

```

Εικ.50 Αποτελέσματα για την εικόνα 4_noise.png

```

Square for area 1 is 761474 pixels, while text area is 67278 pixels,word approximated count is 128 and mean gray value is 234.11333151230377
Square for area 2 is 934908 pixels, while text area is 112360 pixels,word approximated count is 182 and mean gray value is 234.05734040140848
Square for area 3 is 140840 pixels, while text area is 9513 pixels,word approximated count is 15 and mean gray value is 247.1418205055382
Square for area 4 is 661320 pixels, while text area is 65322 pixels,word approximated count is 130 and mean gray value is 234.70952035323293
Square for area 5 is 1380744 pixels, while text area is 112034 pixels,word approximated count is 338 and mean gray value is 233.54846082981348
Square for area 6 is 127635 pixels, while text area is 9340 pixels,word approximated count is 15 and mean gray value is 247.28552513025423
Square for area 7 is 871740 pixels, while text area is 86179 pixels,word approximated count is 162 and mean gray value is 233.93433592584944
Square for area 8 is 246402 pixels, while text area is 14883 pixels,word approximated count is 97 and mean gray value is 242.69369972646325
Square for area 9 is 9996 pixels, while text area is 369 pixels,word approximated count is 2 and mean gray value is 245.65376150460185
Square for area 10 is 187488 pixels, while text area is 15648 pixels,word approximated count is 26 and mean gray value is 246.04167733401604
Square for area 11 is 28261 pixels, while text area is 1530 pixels,word approximated count is 8 and mean gray value is 246.31219702062913
Square for area 12 is 6565 pixels, while text area is 720 pixels,word approximated count is 3 and mean gray value is 244.78781416683198
Square for area 13 is 44330 pixels, while text area is 5455 pixels,word approximated count is 9 and mean gray value is 247.05190615835778

```

Εικ.51 Αποτελέσματα για την εικόνα 5_original.png

```

Square for area 1 is 652536 pixels, while text area is 64651 pixels,word approximated count is 138 and mean gray value is 214.4488871112092
Square for area 2 is 556665 pixels, while text area is 57488 pixels,word approximated count is 135 and mean gray value is 214.74106688942183
Square for area 3 is 190380 pixels, while text area is 17126 pixels,word approximated count is 35 and mean gray value is 217.75938123752496
Square for area 4 is 388702 pixels, while text area is 36165 pixels,word approximated count is 74 and mean gray value is 215.45757675545792
Square for area 5 is 556871 pixels, while text area is 56611 pixels,word approximated count is 128 and mean gray value is 214.72619511520622
Square for area 6 is 751751 pixels, while text area is 77617 pixels,word approximated count is 164 and mean gray value is 214.36657882729787
Square for area 7 is 190380 pixels, while text area is 17255 pixels,word approximated count is 38 and mean gray value is 217.75938123752496
Square for area 8 is 805409 pixels, while text area is 81086 pixels,word approximated count is 228 and mean gray value is 214.14589481865735
Square for area 9 is 765528 pixels, while text area is 80802 pixels,word approximated count is 185 and mean gray value is 214.28917035039868
Square for area 10 is 189189 pixels, while text area is 18538 pixels,word approximated count is 35 and mean gray value is 217.83616383616385
Square for area 11 is 243729 pixels, while text area is 23274 pixels,word approximated count is 62 and mean gray value is 216.65930603251974
Square for area 12 is 2632 pixels, while text area is 22 pixels,word approximated count is 2 and mean gray value is 210.2644376899696
Square for area 13 is 189810 pixels, while text area is 18460 pixels,word approximated count is 42 and mean gray value is 217.77300985195723
Square for area 14 is 5184 pixels, while text area is 519 pixels,word approximated count is 2 and mean gray value is 212.1454475308642
Square for area 15 is 46494 pixels, while text area is 5141 pixels,word approximated count is 9 and mean gray value is 213.17348475072052
Square for area 16 is 675 pixels, while text area is 24 pixels,word approximated count is 1 and mean gray value is 207.95703703703703

```

Εικ.52 Αποτελέσματα για την εικόνα 5_noise.png

• Βιβλιογραφία

- OpenCV Documentation:
<https://docs.opencv.org/3.4/index.html>
- Wikipedia: https://en.wikipedia.org/wiki/Main_Page

- NumPy Documentation:
<https://numpy.org/doc/stable/index.html>
- Richard Szeliski: Computer Vision Algorithms and Applications
- Joseph N. Wilson, Gerhard X. Ritter: Handbook of computer vision algorithms in image algebra (2001)
- Πληροφορίες σχετικά με τις μορφολογικές επεξεργασίες:
<http://homepages.inf.ed.ac.uk/rbf/HIPR2/morops.htm>

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