### 6. Methods and Detection

#### 6.1. Benefits of using a pattern recognition approach

When processing an image, we can easily detect features that are relevant to the task. For instance, if we are looking for edges in an image, we can use gradient operators to find them. These operators help us identify the boundaries of objects within the image.

#### 6.2. Challenges in using a pattern recognition approach

While pattern recognition can be effective, there are several challenges to consider. One of the main challenges is the variation in image quality and lighting conditions. Additionally, some images may contain noise or artifacts that can affect the detection process.

### Table 1: Example Pattern Recognition Results

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Edge</td>
</tr>
<tr>
<td>P2</td>
<td>Corner</td>
</tr>
<tr>
<td>P3</td>
<td>Straight Line</td>
</tr>
</tbody>
</table>

### Table 2: Comparison of Detection Algorithms

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0.8</td>
<td>0.9</td>
<td>0.85</td>
</tr>
<tr>
<td>A2</td>
<td>0.7</td>
<td>0.8</td>
<td>0.75</td>
</tr>
<tr>
<td>A3</td>
<td>0.9</td>
<td>0.7</td>
<td>0.85</td>
</tr>
</tbody>
</table>

### Figure 1: Example Image with Detected Features

[Image: Example Image with Detected Features]

- **Label A**: Edge detected using gradient operators.
- **Label B**: Corner identified by curvature analysis.
- **Label C**: Straight line detected using Hough transform.

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**References**

6.1 Detection of Tumor Antigens: Computerized Detection of Vomits and Other Small Animals

Tumor antigens are proteins that are expressed on the surface of tumor cells. These antigens are often not present on normal cells, but their presence can indicate the presence of a tumor. The detection of tumor antigens can be done using various methods, including immunohistochemistry, flow cytometry, and reverse transcription-polymerase chain reaction (RT-PCR).

The immunohistochemical method involves staining tumor tissue sections with antibodies that recognize specific tumor antigens. Flow cytometry involves analyzing the antigen expression on the surface of tumor cells using fluorescently labeled antibodies. RT-PCR is a molecular method that amplifies and detects specific DNA sequences.

In addition to these methods, computerized detection systems are also used to analyze images of tumor tissues and identify areas of interest that may contain tumor antigens. These systems use algorithms to detect patterns and features that are characteristic of tumor antigens.

The overall goal of tumor antigen detection is to identify areas of interest in the tissue that contain tumor antigens. This information can be used to guide further diagnostic and therapeutic interventions.
In a computer network, data is often exchanged between hosts and devices. To ensure the correct delivery of data, protocols are used to manage the transmission process. One of the key aspects of these protocols is the establishment of connections and the exchange of control packets.

For example, in a network using the TCP protocol, a connection is established by exchanging three-way handshakes. This involves the exchange of SYN and ACK packets between the two endpoints. The SYN packet is used to initiate the connection, and the ACK packet is used to acknowledge the receipt of the SYN packet.

In the figure below, we can see the sequence of packets exchanged during a connection establishment. The figure illustrates the transmission of packets between two endpoints, A and B, using the TCP protocol. The packets are shown in their respective order, with each packet containing a unique sequence number.

```
<table>
<thead>
<tr>
<th>Sequence Number</th>
<th>Packet Type</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SYN</td>
<td>B</td>
</tr>
<tr>
<td>2</td>
<td>SYN+ACK</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>ACK</td>
<td>B</td>
</tr>
</tbody>
</table>
```

The figure also shows the acknowledgment process, where the receiver sends an ACK packet back to the sender to acknowledge the receipt of the last packet in the sequence.

```
<table>
<thead>
<tr>
<th>Sequence Number</th>
<th>Packet Type</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>ACK</td>
<td>A</td>
</tr>
</tbody>
</table>
```

This sequence ensures that both endpoints are synchronized and ready to exchange data. It is a crucial part of the TCP protocol, which is widely used in the Internet to provide reliable data transmission.
6. The deviation of the initial calculated approximate exceptional duration

<table>
<thead>
<tr>
<th>*</th>
<th>Company</th>
<th>Section A</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>i</td>
</tr>
</tbody>
</table>
vowels are deleted. Spreading of [s.g.] is simply a matter of the preferred timing of the [s.g.] gesture with respect to a preceding vowel, possibly to allow more time to achieve a fully abducted glottis. The motivation for deletion is presumably the elimination of a marked sound type, breathy vowels. We shall see further evidence that breathy vowel deletion involves spreading of [s.g.] when we consider the circumstances under which this process is blocked (below).

If breathy vowel deletion is conditioned by [s.g.], the question remains as to why [s.g.] only spreads from /ɪ/ and /ɨ/ preceding a stop, but not from breathy sonorants. I suggest that the reason lies in the fact that these latter sounds are breathy voiced, and hence involve partial abduction of the vocal folds, allowing vibration to persist. Preceding a stop, /ɪ/ is fully voiceless (although it is breathy interocally), and /s/ is always fully voiceless. So these sounds involve greater abduction of the vocal folds than breathy sonorants, and hence might be more prone to extending the duration of the abduction gesture. The spreading constraint can be formulated as in (69).

(69) Extend [s.g.]: [s.g.] associated to a voiceless segment must be associated to a preceding vowel also.

Deletion results if we rank this constraint above Parse V. There are then two conflicting demands on a vowel preceding voiceless [h] or [s]: it must be breathy to satisfy Extend [s.g.], but if it is breathy it violates *[s.g., son]. Given that we have already motivated ranking *[s.g., son] above Parse V, and that Extend [s.g.] is ranked above Parse V, the best resolution of this conflict is to delete the vowel so neither higher-ranked constraint is violated (70).

(70) *[s.g., son], *h >> Extend [s.g.] >> Parse V

(71)

<table>
<thead>
<tr>
<th>Nas/</th>
<th>* [s.g., son]</th>
<th>*h</th>
<th>Extend [s.g.]</th>
<th>Parse V</th>
</tr>
</thead>
<tbody>
<tr>
<td>nas</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>nja</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;</td>
<td>*sì&gt;qì</td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

Breathy vowel deletion is blocked by high tone

Breathy vowel deletion does not apply to a vowel that bears high tone:

(72) a=vò-vòv=sa → *avòv=sa  ‘he burned it’
3S>3s-bumzprs

gá=déed=ga → *gteed=ga  ‘I’m diving’
1SA-dive;prs

This blocking effect can be explained in terms of a constraint against the co-occurrence of [s.g.] and high tone:

(73) *[H

<table>
<thead>
<tr>
<th></th>
<th>[s.g.]</th>
</tr>
</thead>
<tbody>
<tr>
<td>*H</td>
<td></td>
</tr>
</tbody>
</table>

This constraint is phonetically motivated because spreading the glottis has a lowering effect on fundamental frequency, which would disrupt the realization of this high tone. The constraint is also independently required in the analysis of Cherokee tonal phonology (Wright this volume).

Note that this account of the blocking effect of high tone depends on the assumption that breathy vowel deletion involves the spread of [s.g.] onto the deleted vowel, because it explains the blocking in terms of a constraint on this spreading, rather than on deletion per se.

Breathy vowel deletion does not apply to initial vowels

Word-initial vowels are not subject to breathy vowel deletion before /s/:

(74) *i=ga=ya  ‘man’

i=ga  ‘head’

The status of deletion of initial vowels before /h/ is unclear because there do not appear to be any words in Cherokee which begin with a sequence of the form /NìT-.|

It is not clear what the best analysis of these facts is. Possibly there is a constraint against deleting word-initial vowels. This analysis seems stipulative, but such a constraint might have a basis in the importance of word onsets to lexical access (Marsten-Wilson and Zwitserlood 1989). Another possible basis for an explanation for this phenomenon is the fact that words which are underlyingly vowel-initial are typically produced with an initial glottal stop. There might be a constraint against adjacent [constricted glottis] and [s.g.] features, since these features involve contrary movements of the vocal folds, and this constraint would thus prevent [s.g.] from spreading onto a vowel preceded by a glottal stop. Some support for this analysis is provided by the following form in which a vowel preceded by a glottal stop is not deleted by a following /s/:

(75) wîjì=éè=ügà  →  *wîjì=éè=ügà

6.3. Shared properties of metathesis and breathy vowel deletion. There are two properties common to both metathesis and breathy vowel deletion: both are blocked by long vowels, and neither applies to a vowel preceded by a [s.g.] consonant. As mentioned above, we expect these processes to exhibit commonalities, because although they differ in their motivations, both involve [s.g.] and both involve vowel deletion, so any constraints relating to [s.g.] or vowel deletion are likely to affect both processes. We shall see that in each case, a single, well-motivated constraint accounts for the shared property of the two processes.

6.3.1. Metathesis and deletion are blocked by long vowels. Metathesis does not apply across a long vowel, and long vowels are never deleted (76-78).

We might expect the final output of deletion to be *wijì=éè=ügà since pre-consonantal glottal stops surface as glottalization or tonal effects in the dialect of our consultants.
The following are exceptions to the rule:

1. "Red" is not a color.
2. "Blue" is not a color.
3. "Green" is not a color.
4. "Yellow" is not a color.
5. "Orange" is not a color.
6. "Purple" is not a color.
7. "White" is not a color.
8. "Black" is not a color.
The Crossfire Language Requirements

Advisement note: This issue is issued primarily by the Crossfire program in the United States.