Analysis of Kannada script consonants, sub forms, vowels, signs and bring all consonants under “Perfect single consonant form”.

Sushilkumar Nidamarthy
Director
Lampex Electronics Ltd., Hyderabad, India
Email - cdtsmart@yandex.com

Abstract: Kannada and Telugu are two prominent south Indian languages. Both languages have defined vowels, consonants, consonant sub form, vowels sign. Kannada language is with 36 consonants and 16 vowels. Few consonants have extensions below the base level. Similar features also found in few vowels. Consonants and vowels have different height levels. With position placement of vowels and their signs and sub forms Kannada language script becomes multi-level. All these contribute to the complexity levels in the script. Height of consonants and vowels also differs. Some consonants are with sideward and downward extensions. Similar features also found in few vowels. 75% of the consonants are with Head stroke. Position placement of vowels signs is unique in Kannada script compared to Telugu scripts. Kannada script bears more resemblance to the Telugu script.

Key Words: Consonants, sub forms, vowels and signs, Head stroke

1. INTRODUCTION:

In Kanada and Telugu scripts, some characters/consonants commonly have head stroke and few without. Shape and form of Head stroke differ in both languages. Telugu consonants 75% are with Head stroke, V shape – tick – mark and size of Head stroke is uniform to Telugu consonants. 75% Kannada consonants also have a bar with spur type Head stroke. Size of Head stroke of Kannada consonants is not uniform. Height of such consonants is also more than others. In both languages few consonants have Base comma. Some consonants have both Head stroke and Base comma. This means there is no uniformity of base level of the consonants. In both languages few consonants have downward extensions, where in Telugu –TTA – has Head stroke. Many consonants features are similar.

In both languages only one vowel – II is with Head stroke – Telugu and Head stroke – Kannada.

A consonant can only support one vowel sign at a time. In general every consonant has inherent vowel and pronunciation is usually transcribed as “a”. Head stroke is not a vowel sign. Kannada consonants height variation due to few extensions – Head stroke, Base comma and Horns (3 vowels).

Guajarati, Tamil and Malayalam consonants do not have Head stroke. Marathi, Devanagari, Hindi, Bengali and few other languages consonants have head-top joining line. Guajarati, Tamil, and Malayalam consonants are free from such extensions and these scripts look much simpler and consonant features are clear to look. Uniform height of all consonants is desirable to give a better look to the script.

In Kannada, Head stroke may be to differentiate few similar features consonants. Position placement Head stroke also differs according the form of consonant. If similar features consonants are slightly modified and some with substitutes it may be possible to eliminate Head stroke.

Compare

Vowel sign + long tone sign

Fig. 1

- Width increases with additional long tone sign – green line

In Kannada script width increases due to long tone extended sign. Height level also differs due to vowel – I – sign. Shape of vowels signs – I – and – II – is also different. Height of consonant also differs with extension below the base level of few consonants.

Kannada – Head stroke vowels – II –, Vocalic – R – and Vocalic – RR – (3 vowels)
In analysing Kannada language script, main focus is given on consonants, Head stroke, other extensions, sub form, vowels, vowels signs, Halant, and position placement of signs and sub forms. It also covers on reducing consonants form and increase similar features matching and nearby tone harmony pairs for easier learning, read write and print.

Consonants have uniform top and base level and none with any sideward and downward extensions can be referred as “Single consonant form”. Consonants with equal Head–top and base level, nearby width and without any extension can be referred as “Perfect single consonant form”. Same is applicable to vowels as “Perfect single vowel form” and “Single vowel form”.

Kannada consonants can be grouped under two major groups:

A. “Perfect single consonant form”

B. “Single consonant form”

   A. “Perfect single consonant form” – two categories

      1. “Perfect single consonant form”
         Consonants with equal height, similar nearby width, without Head stroke and without other extensions

      2. “Perfect single consonant sideward extension form”
         Equal height consonants with sideward extension but no with top (over the head) extension
         Equal height consonants with sideward extension and no top ward (over the head) extension

   B. “Single consonant form” – six categories

      1. “Single consonant form” – Head stroke consonants without other extensions
      2. Head stroke and Base comma consonants without sideward extension”
      3. Consonant downward extension form
      4. Head stroke consonant with sideward extension”
      5. Single consonant overhead extension
      6. Conjunct consonant with Head stroke

Kannada Script – Analysis

   Level 1 – Kannada consonants – groups
   Consonants –
   SF – Consonant sub forms

   Level 2 – Vowels

   Level 3 – Consonants – Vowels – Levels

   Level 4 – Vowel signs

   Level 5 – Halant sign

   Level 1 – Kannada Consonants² – Class wise – consonants – Astavarga

<table>
<thead>
<tr>
<th>Kannada - Class wise consonants - Astavarga</th>
<th>Font - Nirmala UI - 16 pt</th>
</tr>
</thead>
<tbody>
<tr>
<td>KA</td>
<td>CH</td>
</tr>
<tr>
<td>KHA</td>
<td>CHA</td>
</tr>
<tr>
<td>GA</td>
<td>JA</td>
</tr>
<tr>
<td>GHA</td>
<td>JHA</td>
</tr>
<tr>
<td>NGA</td>
<td>NYA</td>
</tr>
</tbody>
</table>

Fig. 2

- Consonants = 36
Consonants with Head\(\rightarrow\)stroke = 27

<table>
<thead>
<tr>
<th>Series</th>
<th>Consonant</th>
<th>Consonant</th>
<th>Consonant</th>
<th>Consonant</th>
<th>Consonant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td><strong>27</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 3

Consonants – Pairs = 4

```
Consonants - Pairs

\[\begin{array}{cccc}
DDA & DDHA & DA & DHA & PA & PHA & BA & BHA \\
\end{array}\]
```

Fig. 4

- Matching features with nearby tone harmony pairs
- Height of consonants in each pair is not the same due to Base-\(\rightarrow\)comma
- Scope to increase number of pairs and eliminate Base-\(\rightarrow\)comma

Without Head\(\rightarrow\)stroke consonants = 9

“Perfect single consonant form” – consonants group

```
"Perfect single consonant form" - consonants

\[\begin{array}{cccccccc}
KHA & NGA & JA & NYA & TTA & NNA & BA & LA & RRA \\
\end{array}\]
```

Fig. 6

- All with same head-top and base level and nearby width
- No other extensions
- Out of 36, only 7 fall under this group
- Scope to modify consonant – NYA – to bring under “Perfect single consonant form”
Consonants height levels

Fig. 7

- Height levels of consonants = 5
- Below base level – level differ
- Scope to modify/substitute few consonants

Consonants height levels groups

Consonants - Height wise groups

1. KHA NGA JA NNA BA LA RRA
2. KAGA CH TTA TTHA DDA TA DANA PA MA YA RA VA SHA SSA SA HA ILLA
3. GHA CHA JHA DDHA THA DHA PHA BHA
4. NYA
5. KSHA

Fig. 8

- Height level groups = 5
- Group 1 – “Perfect single consonant form” = 7
- Group 2 – “Single consonant form” = 7
  - = Head stroke consonants = 6
  - = consonant with two Horns = 1
- Group 3 – “Single consonant form” = 7 with Head stroke + Base comma
- Group 4 – extended leg below base level consonant
- Group 5 – Conjunct consonant = 1

Fig. 26

Head stroke – Consonants are grouped as under

1. Consonants with Head stroke – no other extension
2. Consonants with Head stroke and Base comma
3. Consonants with Head stroke and Base U sign
4. Consonants with Head stroke, Base U sign and Base comma
5. Conjunct consonants with Head stroke
1. Consonants with Head—stroke = 16

### Consonant with Head—stroke – no other extensions

<table>
<thead>
<tr>
<th>Series</th>
<th>Consonant</th>
<th>Consonant</th>
<th>Consonant</th>
<th>Consonant</th>
</tr>
</thead>
<tbody>
<tr>
<td>KA – క‌</td>
<td>KA – క‌</td>
<td>GA – గ‌</td>
<td>GA – గ‌</td>
<td>GA – గ‌</td>
</tr>
<tr>
<td>CH – చ‌</td>
<td>CH – చ‌</td>
<td>DA – ద‌</td>
<td>DA – ద‌</td>
<td>DA – ద‌</td>
</tr>
<tr>
<td>TTA – త్ట‌</td>
<td>TTHA – త్ట‌</td>
<td>DDA – డ్డ‌</td>
<td>DDA – డ్డ‌</td>
<td>DDA – డ్డ‌</td>
</tr>
<tr>
<td>TA – త‌</td>
<td>TA – త‌</td>
<td>NA – న‌</td>
<td>NA – న‌</td>
<td>NA – న‌</td>
</tr>
<tr>
<td>PA – ప‌</td>
<td>PA – ప‌</td>
<td>VA – వ‌</td>
<td>VA – వ‌</td>
<td>VA – వ‌</td>
</tr>
<tr>
<td>YA – యో‌</td>
<td>RA – ర‌</td>
<td>SA – స‌</td>
<td>SA – స‌</td>
<td>SA – స‌</td>
</tr>
<tr>
<td>SH – శ‌</td>
<td>SH – శ‌</td>
<td>SSA – స్స‌</td>
<td>SSA – స్స‌</td>
<td>SSA – స్స‌</td>
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<tr>
<td>Other</td>
<td>LLA – ల్‌</td>
<td>Total - 16</td>
<td>Total - 16</td>
<td>Total - 16</td>
</tr>
</tbody>
</table>

Fig. 9

- Consonants = 16
- All with uniform base and top-head level – “Single consonant form”
- Length of Head—stroke varies

2. Consonants with Head—stroke and Base—comma = 6

### Consonant with Head—stroke + Base—comma = 6

<table>
<thead>
<tr>
<th>Series</th>
<th>Consonant</th>
<th>Series</th>
<th>Consonant</th>
<th>Consonant</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH – చ‌</td>
<td>CHA – చ‌</td>
<td>TA – త‌</td>
<td>THA – త్</td>
<td>DHA – డ్</td>
</tr>
<tr>
<td>TTA – త్ట‌</td>
<td>DDHA – డ్డ‌</td>
<td>PA – ప‌</td>
<td>PHA – ప‌</td>
<td>BHA – బ‌</td>
</tr>
</tbody>
</table>

Fig. 10

3. Head—stroke and – జు – U = 2

### Consonant with Head—stroke + జు U

<table>
<thead>
<tr>
<th>Series</th>
<th>Consonant</th>
<th>Series</th>
<th>Consonant</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA – ప‌</td>
<td>MA – మ‌</td>
<td>YA – యో‌</td>
<td>YA – యో‌</td>
<td>Total = 2</td>
</tr>
</tbody>
</table>

Fig. 11

4. Consonants with Head—stroke, – జు – U – sign and Base—comma = 2

### Consonant with Head—stroke + జు U + Base—comma

<table>
<thead>
<tr>
<th>Series</th>
<th>Consonant</th>
<th>Series</th>
<th>Consonant</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>KA – క‌</td>
<td>GHA – గా‌</td>
<td>CH – చ‌</td>
<td>JHA – జ‌</td>
<td>Total = 2</td>
</tr>
</tbody>
</table>

Fig. 12
5. Conjunct consonants with Head—stroke = 1

Fig. 13

Consonants – width groups

<table>
<thead>
<tr>
<th>Width groups</th>
<th>Consonants – width groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>KA</td>
</tr>
<tr>
<td>2</td>
<td>GA</td>
</tr>
<tr>
<td>3</td>
<td>TTA</td>
</tr>
<tr>
<td>4</td>
<td>KHA</td>
</tr>
<tr>
<td>5</td>
<td>DDA</td>
</tr>
<tr>
<td>6</td>
<td>DDHA</td>
</tr>
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<td>7</td>
<td>NYA</td>
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<td>8</td>
<td>GHA</td>
</tr>
<tr>
<td>9</td>
<td>JHA</td>
</tr>
<tr>
<td>10</td>
<td>MA</td>
</tr>
<tr>
<td>11</td>
<td>LLA</td>
</tr>
</tbody>
</table>

Fig. 14

- Width groups = 11
- Slight width variation even in “Single consonant form” – consonants
- Width of consonants with – \( \ddot{\text{J}} \) – U is much more than others

Consonants and sub forms

Fig. 15

Sub form groups (SF – Secondary/Sub Forms) – Height groups – Current font

A. Group – 1
B. Group – 2

A. Group – 1

Sub forms - group - 1

Fig. 16
- Base, comma sub forms – cha –, – pha– and – bha –
- Scope to eliminate Base, comma
- Scope to modify/substitute few sub forms

Sub forms – group – 1 – Base, comma = 3

**Group - 1 - Sub forms - Base, comma**
cha pha bha

Fig. 17

- Scope to eliminate Base, comma
- Scope to modify/substitute

Sub forms group – 1 – height levels

**Sub forms - group - 1**
ka ca cha na pa pha ba bha ma ya ra va sha sa lla

Fig. 18

- Height levels vary
- Head stroke sub form – va –
- Height of sub form sub form – ra – slightly less than sub form – gha –
- Scope to bring all sub form to same height
- Scope to eliminate Head stroke
- Scope to modify/substitute few sub forms

**B. Group – 2 = 20**

**Sub forms - group - 2**
kha ga gha nga ja jha nra tta tha dha ddha nna la tha da cha ra la ssa ha

Fig. 19

- Sub forms – ta – and – la – look more symbolic types
- Sub form – ta – is with one 3 Horn, whereas consonant – ta – is with two – (•) – Horns
- Scope to eliminate – ta – 3 Horn
- Sub form – rra – not included
- Head stroke sub form – gha –
- Base, comma sub forms – gha –, – jha –, – ddha–, and – tha – and –ddha–,
- Scope to eliminate Base, comma and Head stroke
- Scope to modify/substitute few sub forms and bring more symbolic sub forms

Sub forms – group – 2 – Base, comma = 5

**Group - 2 - Sub forms - Base, comma**
gha jha ddha tha dha

Fig. 20

- Base, comma sub forms – gha –, – jha –, – ddha–, and – tha – and –ddha–
- Scope to eliminate Base, comma
- Scope to modify/substitute
Sub forms – position placement

**Position placement of sub forms**

![Sub forms diagram]

- Sub form – ra – two forms
- Scope to define sub forms position placement of both groups

**Level – 2 – Vowels**

**Vowels - Kannada = 16**

![Vowels diagram]

- Scope to eliminate Head – stroke
- Height and width increase may be useful
- Scope to reduce height of “O” of vowel – UM –

“Perfect single vowel form” – Vowels = 6

![Perfect single vowel form]

- Conjunct vowels – UM – and – AHA – do not fall under this category
- Height and width increase may be useful

Vowels – height levels

**Kannada vowels - Height levels**

![Height levels diagram]

- Height groups = 3
- Group – 1 = 10 vowels
- Group – 2 = 5 vowels
- Group – 2 = Vowel – I – extended base leg below the base level of vowel
- Scope to eliminate extended leg of vowel – I – to bring it under “Perfect single vowel form”
Conjunct vowels – UM and AHA do not fall under this category

Scope to substitute Vowels – I, U, UU, Vocali – R and Vocali – RR

Scope to modify/substitute few vowels

Vowels – width groups = 5

Vowels - Width groups

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>A</td>
<td>II</td>
<td>U</td>
<td>Vocali-RR</td>
</tr>
<tr>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 25

- Group – 2 – maximum number = 6
- Group – 1 = width lesser than all other groups
- Group – 5 = Vocali-RR – widest of all
- Conjunct vowels not included
- Scope to modify/substitute to bring all vowels to nearby width

Level – 3 – Consonants – Vowels – Levels

"Perfect single consonant form" - "Perfect single vowel form"

Consonants

KHA NGA JA NNA BA LA RRA

Vowels

A AA U UU E EE AI O UM AHA

Height

Fig. 26

- Uniform height of both – “Perfect single consonant form” consonants and “Perfect single vowel form” vowels

Level – 4 – Vowel signs

Vowels - signs

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Sign</th>
<th>Vowel</th>
<th>Sign</th>
<th>Vocali</th>
<th>Sign</th>
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</thead>
<tbody>
<tr>
<td>आ</td>
<td>AA</td>
<td>ओ</td>
<td>O</td>
<td>ऐ</td>
<td>AI</td>
</tr>
<tr>
<td>ऒ</td>
<td>O</td>
<td>ए</td>
<td>E</td>
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<td>ओ</td>
<td>O</td>
<td>ऐ</td>
<td>AI</td>
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<td>AI</td>
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<tr>
<td>ओ</td>
<td>O</td>
<td>ऑ</td>
<td>AU</td>
<td>ऑ</td>
<td>AU</td>
</tr>
</tbody>
</table>

Fig. 27

- Uniform height of both – “Perfect single consonant form” consonants and “Perfect single vowel form” vowels
- Scope to modify/substitute few vowels – signs
Vowel sign – I – shapes

Vowel sign - I - Shapes

Fig. 28

- Different shapes/form of vowel sign – I
- Height level varies
- Consonant shape affected
- Consonant height changes
- Scope to modify the signs suitable to all consonants

Level – 5 – Halant and other signs

Halant sign  

Long tone mark sign  

Fig. 29

- Scope to modify Halant sign and eliminate long tone mark sign

Consonants

- Consonant – NYA – extended leg below base level of consonant = 1
- Consonant with Horns- ₋ – overhead and terminal (TTA) = 1
- Consonants without Head—stroke = 9
- Consonants with Head—stroke = 27
  - Head—stroke – no other extension = 16
  - Head—stroke and Base—comma = 6
  - Head—stroke and — U – sign = 2
  - Head—stroke, — U – sign and Base—comma = 2
  - Conjunct consonants with Head—stroke – KSHA – = 1

- Out of 36 consonants
  - “Perfect single consonant forms” – consonants including – RRA = 8
  - “Single consonant form” = 6

- Consonants – Height levels = 4
- Consonants – width groups = 11
- Consonants – features matching pairs = 4 – with height difference
- Consonant – CA – and –CHA – cannot form a pair although both have nearby pronunciation harmony

Consonant sub forms

- Group – 1 = 15
  - with Base—comma = 3
  - with Head—stroke = 1
- Group – 2 = 20
  - with Base—comma = 5
  - with Head—stroke ccc
  - with – Horn = 1

- Sub form – ra – two forms – Group – 1 = 1 and Group – 2 = 1

Vowels = 16

- “Perfect single vowel form” – Vowels = 6
• Height groups = 3
  o Group – 1 = 10 vowels
  o Group – 2 = 5 vowels
  o Group – 2 = Vowel – I – extended base leg below the base level of vowel

• Vowels – width groups = 5

Vowels – signs = 13

  • Vowel sign – I – different shapes
    o Consonant shape/form and height affected
    o Height level with the sign differs
  • Position placement of vowels signs differs

Halant sign = 1

Extended long tone mark sign = 1

Based on the above analysis, following has been worked out to eliminate multi-level complexity and overcome uneven levels in the Kannada Script.

In order to eliminate such uneven levels it may be necessary to follow certain procedure. This will include modify/substitute consonants, vowels and vowels signs; bring all with the same base level and other position placement of each vowel sign. Based on analysis modification of sub forms of both levels namely ABL – above and below level and BBL – below the base level is also necessary. Spacing between BBL sub forms and consonants is equally important.

A. Consonants

1. Bring Kannada consonants under two groups – “Perfect single form consonants” and “Single form consonants”
2. Eliminating sideward extensions
3. Eliminating downward extension and Horns – < > –
4. Bring all Kannada consonants on the same base level
5. Create maximum number of “Pairs” of consonants – each pair with similar matching features and nearby tone harmony
6. Eliminate Head – stroke to bring all consonants to uniform top–head level
7. downward and horizontal extension to bring all consonants to nearby width
8. Modify/substitute consonants to achieve above 1,2 and 3

B. Consonants secondary forms/Sub forms/Conjunct consonants

1. Modify/substitute sub forms falling under the following groups

   Group – 1 – Above and below level (ABL) Sub forms
   Group – 2 – Below base level (BBL) Sub forms

2. Bring maximum number of Sub forms under Group – 1
3. Pairing of Sub forms with similar features and nearby tone harmony
4. Substitute maximum – 1 – Sub forms with Symbolic forms
5. Position and placement of the ABL Sub forms
6. Position and placement of the BBL Sub forms
7. Spacing between Consonants and BBL Sub forms
8. Vowel signs to ABL Sub forms

C. Vowels

1. Vowel forms, base level, size, modification/substitute
2. Pairing of vowels with similar features and nearby tone harmony
3. Advantages with examples

D. Vowels signs

1. Modification/substitute
2. Adjust the level of vowel signs
3. Position placement of vowels signs without affecting the shape and size of consonants
4. Advantages with each sign examples

E. Halant sign
   1. Modification/substitute
   2. Position placement of vowels signs without affecting the shape and size of consonants
   3. Advantages with example

F. Kannada script and new Kannada Varnamala

G.
1. Brief summary
2. Conclusion
   A. Consonants

Eliminate Head–stroke (HS) – modified consonants

<table>
<thead>
<tr>
<th>KA</th>
<th>GA</th>
<th>CH</th>
<th>TTHA</th>
<th>DDA</th>
<th>TA</th>
<th>DA</th>
<th>NA</th>
<th>PA</th>
<th>RA</th>
<th>VA</th>
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<th>SA</th>
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<td>ತ</td>
<td>ದ</td>
<td>ನ</td>
<td>ಪ</td>
<td>ರ</td>
<td>ವ</td>
<td>ಶ</td>
<td>ಸ</td>
<td>ಹ</td>
<td>ಲ</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 30

- Bar added to KA, GA, TTHA and VA consonants
- Consonant – SSA – modified to match its sub form – ssa – and also KSHA conjunct consonant – ssa –
- Uniform height and base levels
- TA with flat base, flat base to DA and DHA

Modified consonants = 16

<table>
<thead>
<tr>
<th>KA</th>
<th>GA</th>
<th>CH</th>
<th>TTHA</th>
<th>DDA</th>
<th>TA</th>
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<th>PA</th>
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<th>VA</th>
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<th>SA</th>
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<td>ಕ</td>
<td>ಗ</td>
<td>ಚ</td>
<td>ತ್ಥ</td>
<td>ದ್ದ</td>
<td>ತ</td>
<td>ದ</td>
<td>ನ</td>
<td>ಪ</td>
<td>ರ</td>
<td>ವ</td>
<td>ಶ</td>
<td>ಸ</td>
<td>ಹ</td>
<td>ಲ</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 31

- Consonants look good, easier to read write
- Dot/bullet added to consonant – SHA –
- Simplified consonants – SSA – simplified and matching to its sub form
- Scope to substitute modified consonant – TTHA –

Eliminate Head–stroke and Base–comma – modified consonants

<table>
<thead>
<tr>
<th>GHA</th>
<th>CHA</th>
<th>DDHA</th>
<th>TTHA</th>
<th>DHA</th>
<th>PHA</th>
<th>BHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ಗಮ</td>
<td>ಚಮ</td>
<td>ಡಚಮ</td>
<td>ತ್ಥಮ</td>
<td>ಧಮ</td>
<td>ಪಮ</td>
<td>ಭಮ</td>
</tr>
</tbody>
</table>

Fig. 32

- Dot/bullet added to consonant – CHA – and – BHA – and consonants – PHA – Dot/bullet shifted
Modified consonants – Base comma replaced with Dot Bullet = 6

![Modified consonants - Dot/Bullet added]

Fig. 33

- Scope to substitute modified consonant – GHA, CHA and THA

Modified consonant – JHA –

![Eliminated Head stroke (HS). Base comma and U]

Fig. 34

- Scope to substitute modified consonant – JHA –

Modified consonant – MA and YA –

![Eliminated Head stroke (HS) and U Deleted]

Fig. 35

- Modified MA with bar will not clash with any vowel/consonant
- Scope to substitute modified consonant – YA –

Conjunct consonant – KSHA – Modified consonant – KSHA –

![Eliminated Head stroke (HS) - Modified conjunct consonant]

Fig. 36

- Uniform height and base level of Modified KSHA and consonant LA
- Modified KSHA easier to read write

Substitute consonants to modified consonants and pairing consonant

![Substitute consonants - Pair consonant]

Fig. 37

- Similar features matching and nearby tone harmony pairs
- Eliminated – TTA – consonant Horns – and modified
Other substitute consonants

Substitute consonants - Pair consonant

<table>
<thead>
<tr>
<th>Modified consonant</th>
<th>Substitute consonant</th>
</tr>
</thead>
<tbody>
<tr>
<td>YA</td>
<td>YA</td>
</tr>
<tr>
<td>KHA</td>
<td>KHA</td>
</tr>
<tr>
<td>RRA</td>
<td>RA</td>
</tr>
</tbody>
</table>

Fig. 38

- Substitute consonant YA to modified YA
- Substitute consonants KHA pairs with KA and RRA with RA – similar features matching and nearby tone harmony pairs
- Pairs are good for easier learning – read write

Consonant pairs = 11

Consonants - Pairs  11

KA KHA GA GHA CH CHA JA JHA TTA TTHA DDA DDHA TATHA DA DHA PA PHA BA BHA RA RRA

Fig. 39

- Consonants – similar features matching and nearby tone harmony pairs = 11
- Pairs – an asset to Kannada script for easier learning – read write

Modified consonants – NYA – NNA

Modified consonants - NYA - NNA

Fig. 40

- Modified consonants – NYA – width reduced and looks much clear and better
- Modified consonants – NNA – easier to read write

Kannada – Astavarga = 36 consonants

Kannada - Class wise consonants - Astavarga

Fig. 41

- All Astavarga consonants – fall under “Perfect single consonant form”
- Uniform height and base level with nearby width
- Modified consonant – SSA – clear to look, easier to write
- Modified consonants – NA – and – VA – with unique features
- Substitute consonant – CHA – features match with modified – CA – consonant
- Modified consonant – MA – with vertical bar
- Conjunct consonant – KSHA – height matches with other consonants
- All with clear features and easier to read write

**B. Consonants secondary forms/Sub forms/Conjunct consonants**

Modify/substitute sub forms falling under the following groups

Group – 1 – Above and below level (ABL) Sub forms
Group – 2 – Below base level (BBL) Sub forms
Group – 1 – Modified Sub forms

**Modified sub forms - group - 1**

Fig. 42

- Uniform height and base level of modified sub forms
- Substitute sub form – cha – to match substitute – CHA – consonant
- Sub form – kha – added in this group
- Base – comma replaced with – Dot/Bullet
- All sub form with clear features and easier to read write

Group – 2 – Modified/substitute sub forms

**Modified/substitute sub forms - group - 2**

Fig. 43

- Substitute sub forms match to respective consonants
- Base – comma replaced with – Dot/Bullet
- All sub form with clear features and easier to read write
- Scope to substitute few sub forms with symbolic form matching to their features

Modified/substitute sub forms – Position and placement – Spacing

**Sub forms - Group - 1 and Group - 2 - Position placement**

Fig. 44

- Uniform top level of all Group – 2 – sub forms
- Uniform base level of all Group – 1 sub forms
- Base level of all Group – 1 – sub forms in line with top level of Group – 2 – sub forms
- Top level of Group – 1 – sub forms in line with KA bar
- Position placement of Group – 2 – sub forms spacing is most important
- Position placement of Group – 2 – sub forms just below the consonant to give correct pronunciation like Group – 2 – sub forms – ra –
Position and placement of Group – 1 and Group – 2 sub forms

![Diagram of modified/substitute sub forms]

- Uniform top level of all Group – 2 sub forms

C. Vowels

Modification/substitute

- Substitute vowel – II –
  ![Diagram of substitute vowel]
  - Substitute vowel – II – features match with modified vowel – I – and both form a pair with nearby tone harmony and easier to read write

Vowels including modified/substitute = 16

![Diagram of modified vowels]

- Size of UM ‘zero’ is reduced
- Uniform height of vowels – II –, – OO – and – AU

“Perfect single vowel form”

![Diagram of perfect single vowel form]

- Uniform height and nearby width, look clear and easier to read write
- Conjunct vowels UM and AHA not included
D. Vowels signs

Modified vowels – U – and – UU – signs

Modified vowels - उ - ऊ - ऊ - ऊ U - ऊ - ऊ U - ऊ

Modified signs - उ - ऊ - ऊ - ऊ SA - Ş - Ş - Ş

Fig. 49

Advantages of modified – U – and – UU – signs

- More open space below the signs
- Clear view of each consonant features
- Easier to read write

Modified/substitute vowels and signs

- II -

Vowel Sign Vowel Sign

Fig. 50

- All vowels signs are very simple, look much better
- More open space and clear view of each consonant features
- Even with smaller font size easier to read each consonant
- Space saving between works and in the text
- Uniform top levels of signs I, II, E, EE, AI, O, OO, AU and Halant
- Defined position placement of each vowel sign to each consonant – other advantages
- Easier to read write

Uniform top level of short tone and long tone signs and Halant

Fig. 51

Fig. 52
Defined position placement of vowels – signs to consonants – Group wise

### Consonants - vowels - signs - position placement - Groups

<table>
<thead>
<tr>
<th>Collar-Head</th>
<th>Stem-Pin-Cups</th>
<th>Terminal Bar</th>
<th>Terminal Tip</th>
<th>PA – PHA</th>
<th>SA – HA</th>
</tr>
</thead>
<tbody>
<tr>
<td>KA</td>
<td>DA</td>
<td>CH</td>
<td>TA</td>
<td>THA</td>
<td>HA</td>
</tr>
<tr>
<td>KHA</td>
<td>DHA</td>
<td>CHA</td>
<td>TTA</td>
<td>TTHA</td>
<td>LA</td>
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<td>RA</td>
<td>JA</td>
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<td>VA</td>
<td>SA</td>
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<td>GHA</td>
<td>RRA</td>
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<td>BA</td>
<td>SHA</td>
<td>SA</td>
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<td>KSRA</td>
<td>NYA</td>
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</tr>
</tbody>
</table>

Fig. 53

PA – PHA – SA – SSA – group

### Consonants - vowels - signs - PA - PHA - SA - SSA = 4

<table>
<thead>
<tr>
<th>AA</th>
<th>I</th>
<th>II</th>
<th>U</th>
<th>UU</th>
<th>E</th>
<th>EE</th>
<th>Al</th>
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<tbody>
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Fig. 54

Terminal Tip – group

### Consonants - vowels - signs - Terminal tip - Group - Consonants = 11

<table>
<thead>
<tr>
<th>AA</th>
<th>I</th>
<th>II</th>
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</tbody>
</table>

Fig. 55
Terminal Bar – group

Terminal bar group = 3

TA

THA

HA

Fig. 56

Stem – Pin – Cups – group

Consonants - vowels - signs - Stem-Pin-cups group = 7

<table>
<thead>
<tr>
<th>AA</th>
<th>I</th>
<th>II</th>
<th>U</th>
<th>UU</th>
<th>E</th>
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</tbody>
</table>

Fig. 57

Collar Head – group

Consonants - vowels - signs - Collar - Head - Group - Consonants = 11

<table>
<thead>
<tr>
<th>AA</th>
<th>I</th>
<th>II</th>
<th>U</th>
<th>UU</th>
<th>E</th>
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</tr>
</tbody>
</table>

Fig. 58
Eliminated consonants – forms

**Eliminated consonants - forms**

KHA  GHA  CHA  JHA  NYA  TTA  TTHA  MA  YA  SSA  RRA

Fig. 59

Eliminated vowels – forms

**Eliminated vowels - forms**

Vocalic

II  U  UU  R  RR

Fig. 60

Kannada script – compare

**Kannada script - Compare**

_script looks clear and more spacious_

- Features of each consonant with clear view
- Feature of vowel is also very clear
- Vowels signs are very clear to look and identify
- Conjoin consonant – KSHA – goes well with other consonants.
- Script is with more open space, much easier to read
- For new learners it will be an asset

Substitute sub form – ra –

**Substitute - sub form :** Substitute \( \text{ra} \) sub form to \( \text{F} \)

\[
\text{F} \rightarrow \text{ra}
\]

\( \text{F} \) ra pronounced after the consonant

\[
\text{ra} \rightarrow \text{ra}
\]

Sub form \( \text{ra} \) pronounced first then the consonant

Fig. 62

- Substitute – \( \text{ra} \) – sub form to – \( \text{F} \) – ra –
- Position placement of substitute sub form – \( \text{ra} \) – before consonant and – \( \text{J} \) – ra – sub form after the consonant
- After the consonant – consonant is pronounced first and then sub form – \( \text{J} \) – ra

Example

- Pramod – Pra – first consonant – PA – then – \( \text{J} \) – ra – sub form
- Durga – Du – then sub form – \( \text{ra} \) – then consonant – GA
A brief summary

*Level – 1 – Consonants = 36*

- All Head– stroke consonants 27 come under single consonant form
- 11 consonants pairs (22 consonants)
- All consonants fall under “Perfect single consonant form”
- Uniform base level – before uneven
- Defined Astavarga consonants
- 11 consonant forms eliminated

Kannada consonants - extensions and combinations – levels

- Head and terminal tip horns – ( ) – eliminated
- Base – – comma eliminated of all consonants and replaced by Dot • Bullet
- No sideward extension to any consonant

*Level – 2 – Sub forms*

Consonants – Sub form groups

A. Group – 1 – sub forms

- Modified Group – 1 – sub forms
- Uniform height of all Group – 1 – sub forms
- Uniform base level
- Eliminated Base– – comma, replaced by Dot • Bullet – before 3
- Substitute to symbolic – kha – sub form added to Group – 1 – sub forms

B. Group – 2 – sub forms below the base level of consonants

- 3 Symbolic sub forms – before 1
- None with extension – before 7
- Eliminated Base– – comma, replaced by Dot • Bullet – before 3
- before 5
- Sub forms pairs 2 only – before 1
- None with other extension – before 1
- Substitute 1 sub forms
- 3 symbolic sub forms as substitute
- Uniform spacing below base level of consonant – before uneven

*Level – 3– Vowels = 16*

- None with Head– stroke – before 1
- Non with extended leg – before 1
- 1 conjunct vowel modified
- None with sideward extension – before 4
- 7 vowels pairs (14 vowels) – before 5
- 11 “Perfect single vowel Form” – before 4
- 5 “Single vowel Form” – before 2
- 5 vowels forms eliminated
- 2 Height groups

*Level – 4– Vowels signs*

- Vowels – I – II – signs similar features – before 3 shapes each
- Uniform position placement of AA sign to consonants
- U and UU signs simplified
- Modified shape of other signs including Halant sign
- Substitute AI sign, eliminated lower extender bar
- AU sign slightly modified, reducing spiral portion
- Reduced length of all signs
- Eliminating long tone mark sign
- Eliminated U and UU signs for O and OO signs
- Defined position placement of vowels signs to group wise consonants
- Modified position placement of U and UU signs to SHA, SSA, LLA and KSHA consonants

Other details

- Substitute to KHA, GHA, JHA, CHA, TTHA, THA and YA
- Original shape of consonants not affected with vowel signs
- Uniform top – one level of both short tone and long tone signs and also Halant
- Signs length reduced
- 5 vowels substituted – II, U, UU, Vocalic R and Vocalic RR

2. SUMMARY HIGHLIGHTS :

- Modified consonants – Fig. 31
- Consonants – pairs – Fig. 39
- Modified consonants – NYA – and – NNA – Fig. 40
- New – Astavarga – Fig. 41
- Group – 1 – Modified Sub forms – Fig. 42
- Group – 1 – Modified Sub forms – Fig. 43
- Sub forms – Position and placement – Spacing – Fig. 44
- Position and placement of Group – 1 and Group – 2 sub forms – Fig. 45
- Substitute vowel – II – Fig. 46
- Vowels including modified/substitute – Fig. 47
- “Perfect single vowel form” – vowels – Fig. 48
- Modified vowels – U – and – UU – signs – Fig. 49
- Advantages of modified – U – and – UU – signs – Fig. 50
- Modified/substitute vowels and signs – Fig. 51
- Uniform top level of signs – Fig. 52
- Defined position placement of vowels – signs to consonants – Groups – Fig. 53
  - PA – PHA – SA – SSA – group – Fig. 54
  - Terminal Tip – group – Fig. 55
  - Terminal Bar – group – Fig. 56
  - Stem – Pine – Cups – group – Fig. 57
  - Collar Head – group – Fig. 58
- Eliminated consonants – forms – Fig. 59
- Eliminated vowels – forms – Fig. 60
- Kannada script – compare – Fig. 61
- No Unicode for Head stroke and consonant – RRA – and conjunct consonant – KSHA–
- No Unicode for sub forms
- No Unicode for – F – sub form

3. RECOMMENDATIONS:

- New Astavarga - each consonant has unique features and can be adapted
- Each vowel has unique features and substitute vowels can be adapted
- Vowels signs can be adapted
- Group – 1 – and Group – 2 – sub forms are also good to adapt
- Position placement and spacing between consonants and Group – 2 – sub form is good to adapt
- Position placement of Group – 2 – sub form is good to adapt
- All consonants fall under “Perfect consonant form” are good to adapt
- Maximum number of consonants and vowels pairs is also unique for Kannada script
- All above can be adapted to easier learning and read write
- Position placement of vowels signs for each consonant is good to adapt
- Position placement of signs U and UU to SHA, SSA, LLA and KSHA can be adapted
- Font developer need to focus on uniformity on shape of consonants, vowels, sub forms, vowels signs and Halant
4. CONCLUSION:

In this work, several factors have been analysed including consonants - their features and structures, pairing of consonants, consonant sub forms and spacing etc. Vowels and vowel sign features, Halant - symbolic – sign and Head stroke have also been analysed. Procedure adopted eliminated complexity, create more open space depict features of each consonant, vowels, signs, Halant and sub forms. All consonants defined under new Astavarga fall under “Perfect single consonant form”. Methods yielded good results which are highlighted under brief summary above. Height of vowels has been brought down to two levels. Vowels signs have been simplified. Uniform top level of short tone and long tone vowels signs and Halant is good for the script. Position placement of vowels signs for each consonants group is well defined. Defined position placement of vowels sign for each consonant is very important giving clear view of each consonant features.

Maximum number pairs of consonants and vowels are an asset to Kannada script. Simple modification show good results. Few substitutes both for consonants and vowels are good to adapt. Few consonants forms have been eliminated. All consonants and vowels have same base level. Vowels signs look good and give more open space. Symbolic sub forms are also good with unique identity. All will add beauty to the script. Script example gives clear view of words, consonants with sub forms and vowel signs with more open space.

All these give about 30% space saving and nullify multi-level complexity. One level with vowels signs like other Indic script will enhance beauty of Kannada script. More number of matching pairs would assist for easier learning, read write and print. Vowels also look very clear and saving space. It may also reduce number of strokes with new fonts. It may also assist in developing efficient OCR software. Standardization of Kannada fonts is also equally important.

REFERENCES:

1. Kannada “U0C00 Unicode”