

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

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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 sideward →, extensions and their width is also more. In Kannanda consonant –TTA – has two Horns→, where in Telugu –TTA – has Head→comma. 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→.

Guajarati, Tamil and Malayalam consonants do not have Head→stroke. Marathi, Devanagari, Hindi, Bengali and few other languages consonants have head-top joining line. Gujarati, 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

ರೈತನೊಬ್ಬನ ತೋಟದಲ್ಲಿದ್ದ ಸೇಬು ಮರದಲ್ಲೊಂದೇ ಒಂದು ಹಣ್ಣು

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

Kannada - Class wise consonats - Astavarga

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KA	CH	TTA	TA	PA	YA	SA	LLA
ಕ	ಚ	ಟ	ತ	ಪ	ಯ	ಶ	ಲ
ಖ	ಛ	ಠ	ಥ	ಫ	ರ	ಷ	ಕ್ಷ
ಗ	ಜ	ಡ	ದ	ಬ	ಲ	ಸ	ರ್ರ
ಘ	ಞ	ಢ	ಧ	ಭ	ವ	ಹ	
ಂಗ	ನ್ಯ	ಣ	ನ	ಮ			

Fig. 2

- Consonants = 36

Consonants with Head-→stroke = 27

Consonant with Head-→ stroke

Series –	Consonant	Consonant	Consonant	Consonant	Consonant
KA – क	KA – क	GA – ग	GHA – घ		
CH – च	CH – च	CHA – छ	JHA – ज्ञ		
TTA – ट	TTHA – ठ	DDA – ड	DDHA – ढ		
TA – त	TA – त	THA – थ	DA – द	DHA – ध	NA – न
PA – प	PA – प	PHA – फ	BHA – भ	MA – म	
YA – य	YA – य	RA – र	VA – व		
SA – श	SHA – ष	SSA – स	SA – स	HA – ह	
Others	LLA – ल	KSHA – क्ष			Total - 27

Fig. 3

Consonants – Pairs = 4

Consonants - Pairs

DDA DDHA DA DHA PA PHA BA BHA
 ड ढ द ध प फ ब भ

Fig. 4

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

Without Head-→stroke consonants = 9

Consonants without Head-→ stroke = 9

KHA NGA JA NYA TTA NNA BA LA RRA
 ख ग ज ञ ट ण ब ल र

Fig. 5

- Height of consonants – TTA– is more due to Horns-↺ – on Head and terminal
- Scope to eliminate Horns-↺ –

“Perfect single consonant form” – consonants group

“Perfect single consonant form” - consonants

KHA NGA JA NNA BA LA RRA
 ख ग ज ण ब ल र

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

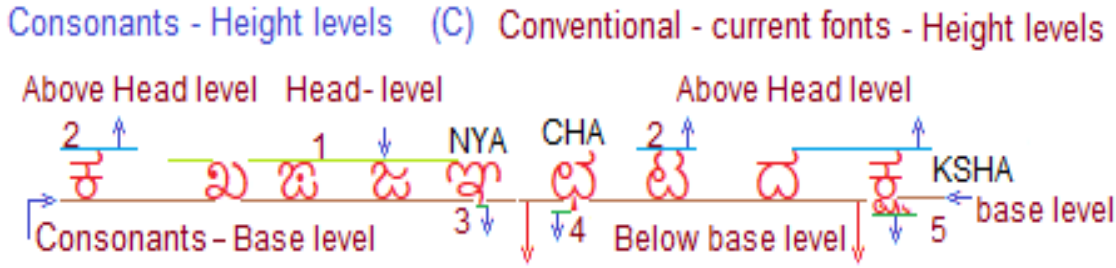


Fig. 7

- 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 ಖ ಙ ಜ ಣ ಬ ಲ ಱಿ
KHA NGA JA NNA BA LA RRA
- 2 ಕ ಗ ಚ ಟ ಠ ಡ ತ ದ ನ ಪ ಮ ಯ ರ ವ ಶ ಷ ಸ ಹ ಳ
KAGA CH TTA TTHA DDATA DANAPA MA YA RA VA SHA SSA SA HA LLA
- 3 ಘ ಛ ಝ ಞ ಥ ಧ ಫ ಭ
GHA CHA JHA DDHA THA DHA PHA BHA
- 4 NYA ಞ್
- 5 KSHA - ಕ್ಷ

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 ↺ – U – sign
4. Consonants with Head→stroke, ↺ – U – sign and Base↺comma
5. Conjunct consonants with Head→stroke

1. Consonants with Head-→stroke = 16

Consonant with Head-→stroke - no other extensions

Series -	Consonant	Consonant	Consonant	Consonant
KA - ಕ	KA - ಕ	GA - ಗ		
CH - ಚ	CH - ಚ			
TTA - ಟ	TTHA - ಠ	DDA - ಡ		
TA - ತ	TA - ತ	DA - ದ	NA - ನ	
PA - ಪ	PA - ಪ			
YA - ಯ	RA - ರ	VA - ವ		
SA - ಸ	SHA - ಶ	SSA - ಷ	SA - ಸ	HA - ಹ
Other	LLA - ಳ			Total - 16

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

Series -	Consonant	Series -	Consonant	Consonant
CH - ಚ	CHA - ಛ	TA - ತ	THA - ಠ	DHA - ಡ
TTA - ಟ	DDHA - ಡಠ	PA - ಪ	PHA - ಫ	BHA - ಭ

Fig. 10

3. Head-→stroke and -U = 2

Consonant with Head-→stroke + U

Series -	Consonant
PA - ಪ	MA - ಮ
YA - ಯ	YA - ಯ

Total = 2

Fig. 11

4. Consonants with Head-→stroke, -U sign and Base-↵ comma = 2

Consonant with Head-→stroke + U + Base-↵ comma

Series -	Consonant
KA - ಕ	GHA - ಘ
CH - ಚ	JHA - ಜಞ

Total = 2

Fig. 12

5. Conjunct consonants with Head-→stroke = 1

Conjunct consonant with Head-→ stroke

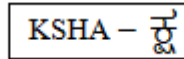


Fig. 13

Consonants – width groups

Consonants - width groups

ಕ KA	ಙ NGA	ನ NA	ಖ KHA	ಡ DDA	ಛ CHA	ಞ NYA	ಘ GHA	ಝ JHA	ಮ MA	ಲ ಲ LA
ಗ GA	ಜ JA	ಪ PA	ಟ TTA	ಢ DDHA	ಠ HA		ಚ CH	ಯ YA		
ಠ TTHA		ಫ PHA	ಥ THA	ಣ NNA						
ತ TA		ಲ LA	ದ DA	ಱ RRA						
ರ RA		ವ VA	ಧ DHA							
ಶ SHA		ಷ SSA	ಬ BA							
ಸ SA			ಭ BHA							
ಕ್ಷ KSHA										

Fig. 14

- Width groups = 11
- Slight width variation even in “Single consonant form” – consonants
- Width of consonants with -↷ – U is much more than others

Consonants and sub forms

Consonants - Sub forms

ಕ	ಖ	ಗ	ಘ	ಙ	ಚ	ಛ	ಜ	ಝ	ಞ
ka	kha	ga	gha	nga	ca	cha	ja	jha	jna
ಟ	ಠ	ಡ	ಢ	ಣ	ತ	ಥ	ದ	ಧ	ನ
tta	ttha	dda	ddha	nna	ta	tha	da	dha	na
ಪ	ಫ	ಬ	ಭ	ಮ	ಯ	ರ	ಲ	ವ	
pa	pha	ba	bha	ma	ya	ra	la	va	
ಶ	ಷ	ಸ	ಹ	ಲ					
sha	ssa	sa	ha	lla					

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

ka	ca	cha	na	pa	pha	ba	bha	ma	ya	ra	va	sha	sa	lla
ಕ	ಚ	ಛ	ನ	ಪ	ಫ	ಬ	ಭ	ಮ	ಯ	ರ	ಲ	ವ	ಶ	ಲ

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

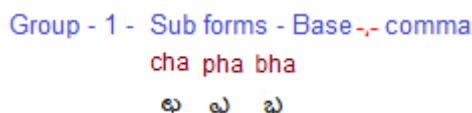


Fig. 17

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

Sub forms group – 1 – height levels

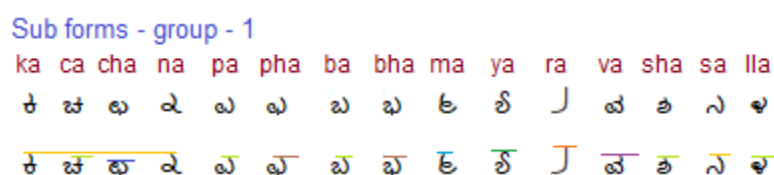


Fig. 18

- 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*

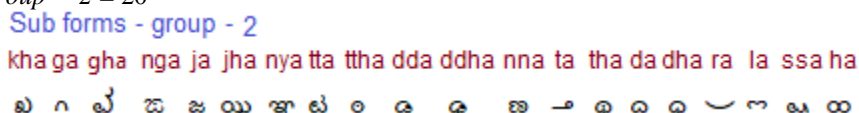


Fig. 19

- Sub forms – ta – and – la – look more symbolic types
- Sub form – ta – is with one ʸ Horn, whereas consonant – ta – is with two – ʹ ʸ – Horns
- Scope to eliminate – ta – ʸ 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



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

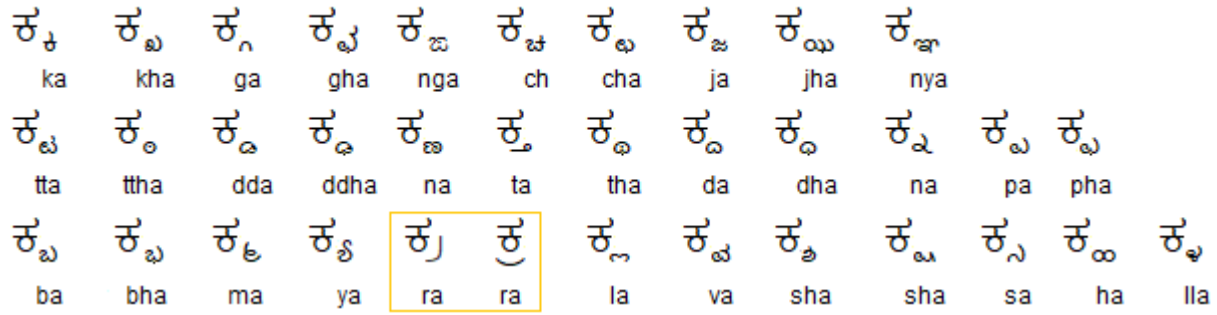


Fig. 21

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

Level – 2 – Vowels

Vowels - Kannada = 16

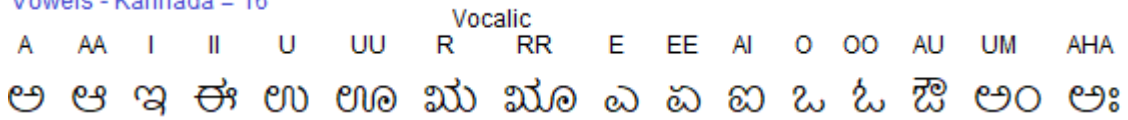


Fig. 22

- Head→stroke vowels – II –, Vocalic – R and Vocalic – RR –
- 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”

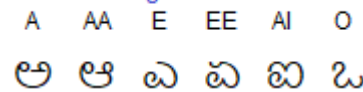


Fig. 23

- 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

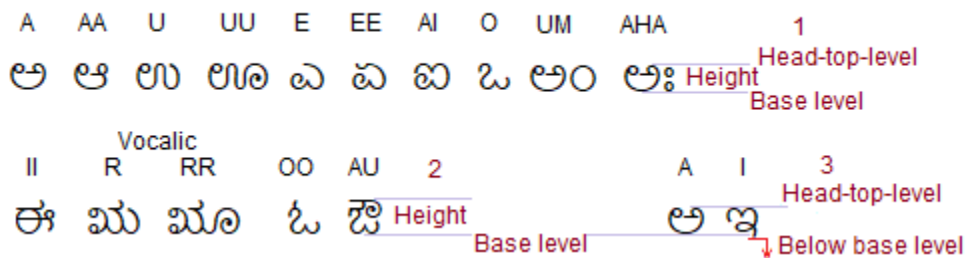


Fig. 24

- 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

1	2	3	4	5
I ಇ	A ಅ	II ಈ	UU ಉ	Vocalic-RR ಮು
O ಒ	AA ಆ	U ಉ		
OO ಓ	E ಎ	Vocalic-R ಮು		
	EE ಏ			
	AI ಐ			
	AU ಔ			

Fig. 25

- Group – 2 – maximum number = 6
- Group – 1 = width lesser than all other groups
- Group – 5 = Vocalic – 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	Vowels
KHA NGA JA NNA BA LA RRA	A AA U UU E EE AI O UM AHA
ಖ ಜ ಜ ಣ ಬಲಱಿ	ಅಆಉಊಎಏಐಒಅಃ Height

Fig. 26

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

Level – 4 – Vowel signs

Vowels - signs

Vowel	Sign	Vowel	Sign	Vocalic	Sign
ಆ	AA ಁ	ಎ	E ಂ	ಮು	R ಃ
ಇ	I ಿ	ಏ	EE ಃ	ಮೂ	RR ಄
ಈ	II ಿಃ	ಐ	AI ಿಃ		
ಉ	U ಁ	ಒ	O ಂಃ		
ಊ	UU ಂಃ	ಓ	OO ಂಃಃ		
		ಔ	AU ಂಃಃಃ		

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



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

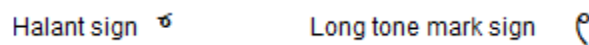


Fig. 29

- 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 – (ಠ) – overhead and terminal (TTA) = 1
- Consonants without Head – (ಠ) stroke = 9
- Consonants with Head – (ಠ) stroke = 27
 - Head – (ಠ) stroke – no other extension = 16
 - Head – (ಠ) stroke and Base – (ಠ) comma = 6
 - Head – (ಠ) stroke and – (ಠ) – U – sign = 2
 - Head – (ಠ) stroke, – (ಠ) – U – sign and Base – (ಠ) comma = 2
 - Conjunct consonants with Head – (ಠ) 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 – (ಠ) comma = 3
 - With Head – (ಠ) stroke = 1
- Group – 2 = 20
 - with Base – (ಠ) comma = 5
 - with Head – (ಠ) stroke ccc
 - with – (ಠ) 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
 - Group – 1 = 10 vowels
 - Group – 2 = 5 vowels
 - 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
 - Consonant shape/form and height affected
 - Height level with the sign differs
- Position placement of vowel 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 vowel 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. Vowel 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

Eliminated Head→stroke (HS) - Modified consonants

KA	GA	CH	TTHA	DDA	TA	DA	NA	PA	RA	VA	SHA	SSA	SA	HA	LLA
ಕ	ಗ	ಚ	ಠ	ಡ	ತ	ದ	ನ	ಪ	ರ	ವ	ಶ	ಷ	ಸ	ಹ	ಲ
ಕ	ಗ	ಚ	ಠ	ಡ	ತ	ದ	ನ	ಪ	ರ	ವ	ಶ	ಷ	ಸ	ಹ	ಲ
ಕ	ಗ		ಠ	ಡ	ತ	ದ	ನ	ಪ	ರ	ವ	ಶ	ಷ	ಸ	ಹ	ಲ

HS deleted
Modified

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

Eliminated Head→stroke (HS) - Modified consonants

KA	GA	CH	TTHA	DDA	TA	DA	NA	PA	RA	VA	SHA	SSA	SA	HA	LLA
ಕ	ಗ	ಚ	ಠ	ಡ	ತ	ದ	ನ	ಪ	ರ	ವ	ಶ	ಷ	ಸ	ಹ	ಲ

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

Eliminated Head→stroke (HS) and Base→comma Modified consonants

GHA	CHA	DDHA	THA	DHA	PHA	BHA
ಘ	ಛ	ಢ	ಠ	ಢ	ಫ	ಭ
ಘ	ಛ	ಢ	ಠ	ಢ	ಫ	ಭ
	ಛ				ಫ	ಭ

Modified
Dot/Bullet added

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
 GHA CHA DDHA THA PHA BHA
 ଝ ଞ ଣ ଠ ଡ ଢ

Fig. 33

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

Modified consonant – JHA –

Eliminated Head → stroke (HS) , Base – comma and) U
 Modified • Dot/Bullet added Modified consonants
 JHA ଝ ଞ ଣ

Fig. 34

- Scope to substitute modified consonant – JHA –

Modified consonant – MA – and – YA –

Eliminated Head → stroke (HS) and) U
 Modified) U Deleted Modified consonants
 MA ଝ ଞ ଣ MA ଝ 'Bar added
 YA ଝ ଞ ଣ YA ଝ

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
 Bar – added Modified KSHA LA Modified consonant
 KSHA ଝ ଞ ଣ ଠ ଡ ଢ Height ଝ KSHA

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

Modified consonant	Substitute consonant	Pair consonant	Modified consonant	Substitute consonant	Pair consonant
GHA ଝ →	ଠ GHA	ଠ GA	TTHA ଠ →	ଠ TTHA	ଠ TTA
CHA ଞ →	ଞ CHA	ଞ CH	THA ଡ →	ଢ THA	ଢ TA
JHA ଣ →	ଞ JHA	ଞ JA			

Fig. 37

- Similar features matching and nearby tone harmony pairs
- Eliminated – TTA – consonant Horns – () – and modified

Other substitute consonants

Substitute consonants - Pair consonant

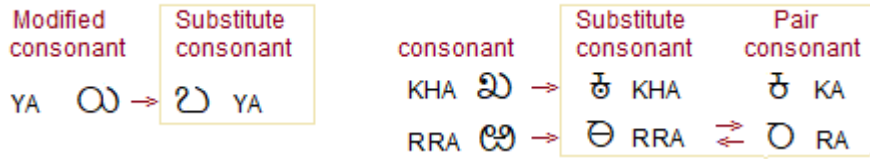


Fig. 38

- 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
 ಕ ಕ ಾ ಾ ಚ ಚ ಜ ಜ ಟ ಟ ಡ ಡ ತ ತ ಡ ಡ ಲ ಲ ಬ ಬ ರ ರ

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 – ಇ – NYA – and – ಳ – NNA

Modified consonants - NYA - NNA

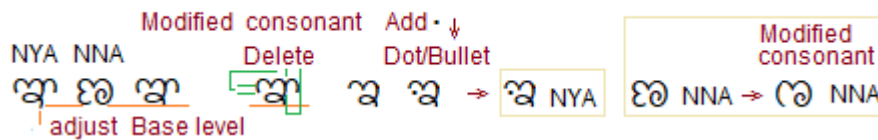


Fig. 40

- 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

KA	CH	TTA	TA	PA	YA	SA	
KA ಕ	CH ಚ	TTA ಟ	TA ತ	PA ಪ	YA ಬ	SHA ಷ	LLA ಳ
KHA ಕೆ	CHA ಚೆ	TTHA ಠ	THA ತೆ	PHA ಫ	RA ರ	SSA ಸ	KSHA ಕ್ಷ
GA ಗ	JA ಜ	DDA ಡ	DA ಡ	BA ಬ	LA ಲ	SA ಸ	RRA ರ
GHA ಗೆ	JHA ಜೆ	DDHA ಢ	DHA ಢ	BHA ಭ	VA ವ	HA ಹ	
NGA ಙ	NYA ಇ	NNA ಳ	NA ನ	MA ಮ			

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

ka kha ca cha na pa pha ba bha ma ya ra va sha sa lla
 ಕ ಕ ಘ ಘ ನ ಪ ಫ ಬ ಭ ಮ ಯ ರ ವ ಶಾ ಸ ಲಲ

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

ga gha nga ja jha nya tta ttha dda ddha nna ta tha da dha ra la ssa ha
 ಗ ಗ ಘ ನ ಜ ಜ ಘ ನ ತ ತ ಥ ದ ದ ಥ ನ ನ ತ ತ ಥ ದ ಥ ರ ಲ ಸ್ಸ ಹ

Fig. 43

- Substitute sub forms match to respective consonants
- Base--,- comma replaced with - ⋅ - Dot/Bullet
- Symbolic sub forms pair – tta – and – ttha – like symbolic sub form – ta – and – tha – pair
- 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

KA ಕ ಕ ಘ ಘ ನ ಪ ಫ ಬ ಭ ಮ ಯ
 ತ ತ ಥ ತ ಥ ಲ ಬ ಭ ಮ ಯ
 Group-1 Group-2
 ತ ತ ದ ಲ ಬ ಮ ಯ
 ತ ತ ದ ಲ ಬ ಮ ಯ

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

Modified/substitute sub forms – Position placement of sub forms

Modified/substitute sub forms – Position placement of sub forms										Consonant KA ്		
ക	ക	ഗ	ഗ	ങ	ച	ച	ജ	ജ	ഞ	ന	പ	പ
ka	kha	ga	gha	nga	ch	cha	ja	jha	nya			
ത	ത	ദ	ദ	ന	ത	ത	ദ	ദ	ന	പ	പ	
tta	ttha	dda	ddha	na	ta	tha	da	dha	na	pa	pha	
ബ	ബ	മ	മ	ര	ര	ല	വ	ശ	ശ	സ	ഹ	ല
ba	bha	ma	ya	ra	ra	la	va	sha	sha	sa	ha	lla

Fig. 45

- Uniform top level of all Group – 2 sub forms

C. Vowels

Modification/substitute

Substitute vowel – II –

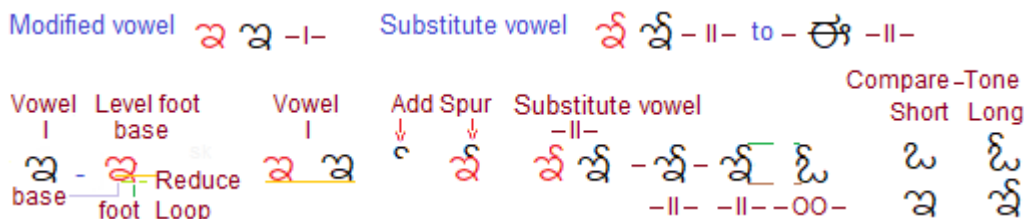


Fig. 46

- 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

Modified vowels

Modified vowels												Vocalic			
A	AA	I	II	U	UU	R	RR	E	EE	AI	O	OO	AU	UM	AHA
അ	ഈ	ഇ	ഈ	ഉ	ഉ	ര	ര	എ	എ	ഈ	ഈ	ഊ	ഊ	ഊ	ഊ

Fig. 47

- Substitute vowels – II –, – U –, – UU –, Vocalic – R – and Vocalic – RR –
- Size of UM ‘zero’ is reduced
- Uniform height of vowels – II –, – OO – and – AU

“Perfect single vowel form”

Perfect single vowel form - vowels

Perfect single vowel form - vowels										Vocalic		
A	AA	I	U	UU	R	RR	E	EE	AI	O		
അ	ഈ	ഇ	ഉ	ഉ	ര	ര	എ	എ	ഈ	ഈ		

Fig. 48

- 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

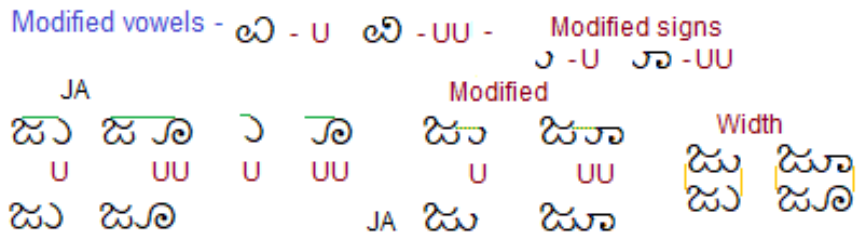


Fig. 49

Advantages of modified – U – and – UU – signs

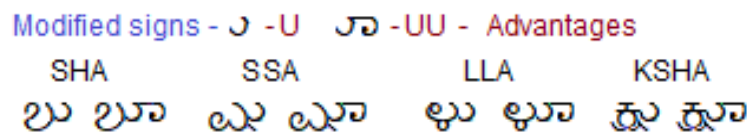


Fig. 50

- 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
ಆ	AA	ಎ	E
ಇ	I	ಐ	EE
ಇ	II	ಓ	AI
ಉ	U	ಒ	O
ಊ	UU	ಓ	OO

Vowel	Sign
ಔ	AU
ಋ	R
ೠ	RR
ಃ	Halant

Fig. 51

- 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

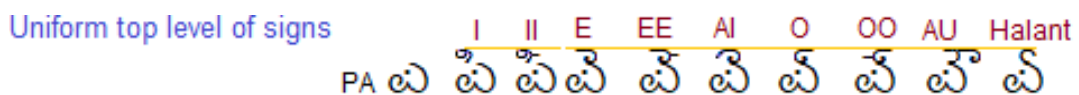


Fig. 52

Defined position placement of vowels – signs to consonants – Group wise

Consonants - vowels - signs - position placement - Groups

Collar-Head				Stem-Pin-Cups		Terminal Bar		Terminal tip				PA – PHA SA – HA	
KA	क	DA	○	CH	च	TA	त	TTA	ट	YA	य	PA	प
KHA	क़	DHA	◌	CHA	च़	THA	त़	TTHA	ट़	LA	ल	PHA	फ
GA	ग	RA	○	JA	ज	HA	ह	NA	न	VA	व	SSA	झ
GHA	ग़	RRA	◌	JHA	ज़			BA	ब	SHA	श	SA	स
DDA	ड	KSHA	ख़	NGA	ण			BHA	भ	LLA	ळ		
DDHA	ड़			NYA	य़			MA	म				
				NNA	ऩ								

Fig. 53

PA – PHA– SA – SSA – group

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

	AA	I	II	U	UU	E	EE	AI	O	OO	AU	UM	AHA	Halant
PA	प	पा	पी	पै	पु	पू	पे	पै	पौ	पू	पौ	पुम	पः	पं
PHA	फ	फा	फ़ी	फ़ै	फ़ु	फ़ू	फ़े	फ़ै	फ़ौ	फ़ू	फ़ौ	फ़ुम	फ़ः	फ़ं
SA	स	सा	सी	सै	सु	सू	से	सै	सौ	सू	सौ	सुम	सः	सं
SSA	झ	झा	झी	झै	झु	झू	झे	झै	झौ	झू	झौ	झुम	झः	झं

Fig. 54

Terminal Tip – group

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

	AA	I	II	U	UU	E	EE	AI	O	OO	AU	UM	AHA	Halant
TTA	ट	टा	टी	टै	टु	टू	टे	टै	टौ	टू	टौ	टुम	टः	टं
TTHA	ट़	ट़ा	ट़ी	ट़ै	ट़ु	ट़ू	ट़े	ट़ै	ट़ौ	ट़ू	ट़ौ	ट़ुम	ट़ः	ट़ं
NA	न	ना	नी	नै	नु	नू	ने	नै	नौ	नू	नौ	नुम	नः	नं
BA	ब	बा	बी	बै	बु	बू	बे	बै	बौ	बू	बौ	बुम	बः	बं
BHA	भ	भा	भी	भै	भु	भू	भे	भै	भौ	भू	भौ	भुम	भः	भं
MA	म	मा	मी	मै	मु	मू	मे	मै	मौ	मू	मौ	मुम	मः	मं
YA	य	या	यी	यै	यु	यू	ये	यै	यौ	यू	यौ	युम	यः	यं
LA	ल	ला	ली	लै	लु	लू	ले	लै	लौ	लू	लौ	लुम	लः	लं
VA	व	वा	वी	वै	वु	वू	वे	वै	वौ	वू	वौ	वुम	वः	वं
SHA	श	शा	शी	शै	शु	शू	शे	शै	शौ	शू	शौ	शुम	शः	शं
LLA	ळ	ळा	ळी	ळै	ळु	ळू	ळे	ळै	ळौ	ळू	ळौ	ळुम	ळः	ळं

Fig. 55

Terminal Bar – group

Terminal bar group = 3

TA	ॐ	ॐः	ॐः	ॐ	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः
THA	ॐ	ॐः	ॐः	ॐ	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः
HA	ॐ	ॐः	ॐः	ॐ	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः	ॐः

Fig. 56

Stem – Pin – Cups – group

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

	AA	I	II	U	UU	E	EE	AI	O	OO	AU	UM	AHA	Halant
NGA	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
CH	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
CHA	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
JA	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
JHA	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
NYA	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
NNA	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ

Fig. 57

Collar Head – group

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

	AA	I	II	U	UU	E	EE	AI	O	OO	AU	UM	AHA	Halant
KA	क	क	क	क	क	क	क	क	क	क	क	क	क	क
KHA	क	क	क	क	क	क	क	क	क	क	क	क	क	क
GA	ग	ग	ग	ग	ग	ग	ग	ग	ग	ग	ग	ग	ग	ग
GHA	ग	ग	ग	ग	ग	ग	ग	ग	ग	ग	ग	ग	ग	ग
DDA	ड	ड	ड	ड	ड	ड	ड	ड	ड	ड	ड	ड	ड	ड
DDHA	ड	ड	ड	ड	ड	ड	ड	ड	ड	ड	ड	ड	ड	ड
DA	द	द	द	द	द	द	द	द	द	द	द	द	द	द
DHA	द	द	द	द	द	द	द	द	द	द	द	द	द	द
RA	र	र	र	र	र	र	र	र	र	र	र	र	र	र
RRA	र	र	र	र	र	र	र	र	र	र	र	र	र	र
KSHA	क्ष	क्ष	क्ष	क्ष	क्ष	क्ष	क्ष	क्ष	क्ष	क्ष	क्ष	क्ष	क्ष	क्ष

Fig. 58

Eliminated consonants – forms

Eliminated consonants - forms

KHA GHA CHA JHA NYA TTA TTHA MA YA SSA RRA
ಖ ಘ ಛ ಜ ಞ ಟ ಠ ಮ ಯ ಸ ರ

Fig. 59

Eliminated vowels – forms

Eliminated vowels - forms

II U UU R^{Vocalic} RR
ಈ ಉ ಊ ಋ ೠ

Fig. 60

Kannada script – compare

Kannada script - Compare

ಬಳ್ಳಾರಿ ನಗರಂ ಆದಿರೇವತಿ ಕನಕ ದುರ್ಗಮ್ಮ ರೇವಣ್ಣಾನಿ ಸೆಡೆ
ಬಂಡೆ ಏತ್ಸವ ಲಕ್ಷಾಂತರ ಬಕ್ತರ ನಿಡುವೆ ನಡೆಬತು.

Fig. 61

- 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
- Conjunct 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 ಳ ra sub form to ಳ

ದುರ್ಗಮ್ಮ → ದುಗ್ರಮ್ಮ ದುರ್ಗಮ್ಮ
ಳ → ಳ ಳ ra pronounced after the consonant
ದುರ್ಗಮ್ಮ → ದುಗ್ರಮ್ಮ
Sub form ಳ ra pronounced first then the consonant ಳ Pra

Fig. 62

- Substitute – ಳ – ra – sub form to – ಳ – ra –
- Position placement of substitute sub form – ಳ – ra – before consonant and – ಳ – ra – sub form after the consonant
- After the consonant – consonant is pronounced first and then sub form – ಳ – ra

Example

- Pramod – Pra – first consonant – PA – then – ಳ – ra – sub form
- Durga – Du – then sub form – ಳ – 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 Unicode¹ for Head – stroke and consonant – RRA – and conjunct consonant – KSHA –
- No Unicode¹ for sub forms
- No Unicode¹ 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 and spacing 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

- “zero” of UM can be adapted
- Standardization of fonts
- New Unicode may be defined for each sign, Halant, consonant and vowel
- Unicode can be defined for all sub forms

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 Unicode¹”
2. Kannada script² – “https://en.wikipedia.org/wiki/Kannada_script”
3. Sushilkumar Nidamarthy³: “Analysis of multi-level Telugu Script, feature of consonant, sub forms, vowels and their signs, Halant, position placement and spacing of various forms and the scope to eliminate complexity levels for easier learning, read write and print³” – <http://shikshansanshodhan.researchculturesociety.org/volume-4-issue-6-published-in-june-2021/3>
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