Observations on the Encoding of Archaic Sinhala Numerals in Unicode/UCS

Presented by H. E. Prof. J. B. Disanayaka
on behalf of
Information and Communication Technology Agency of Sri Lanka (ICTA) and
Sri Lanka Standards Institute (SLSI)

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References: N3195R-L2/07-002R, L2/08-007, L2/08-068

Background

We wish to thank Mr. Micheal Everson for taking the initiative to include Sinhala archaic numerals in the Universal Character Set (UCS). While appreciating his pioneering efforts in the early stages of introduction of Sinhala in UCS, we extend our apologies for the delay in communicating our research findings in Sinhala numerals of the last several years. It is true that most present-day Sinhala people use modern European digits and are unaware of the existence of the traditional system of numerals and methods of numeration.

However there are four groups of people who were aware these traditional systems:

   a. Linguists who have access to "A Comprehensive Grammar of the Sinhalese Language" (CGSL) of Abraham Mendis Gunesekera (1891);
   b. Scribes of Sinhala palm-leaf writings;
   c. Students of palm-leaf writing such as W.A De Silva whose "Catalogue of Palm leaf manuscripts in the Library of Colombo Museum" is considered one of most comprehensive studies on Palm-leaf Manuscripts;
   d. Modern astrologers who use these numerals for recording of traditional horoscope charts.

Observations on N3195R L2/07-002R

In his proposal, Mr. Everson introduces twenty characters in UCS from 0DE7 to 0DFF. Of the twenty characters, the first nine are simple units and the remaining eleven are conjunct or conjoined characters such the ones for as ten, twenty etc.

The main observation relates to the existence or non-existence of zero in Sinhala archaic numerals or zero place holder concept.

We have adequate evidence to prove that there was a distinctive sign for zero as well as a zero-place-holder concept. Our evidence comes from four main sources:

1. W. A. De Silva : "Catalogue of Palm-leaf Manuscripts in the Library of Colombo Museum"

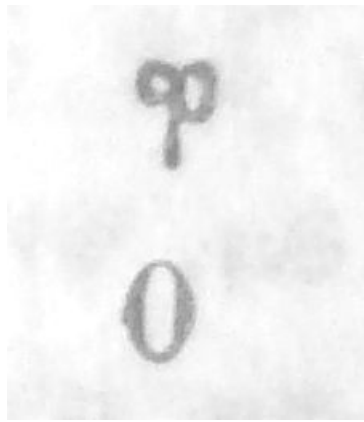This catalog shows a symbol for the zero, as shown in Figure 1.

Figure 1 - Extract from Catalogue showing symbol for zero

This symbol resembles the stroke used in Sinhala writing to nullify or negate the built-in-vowel of a consonant, called 'hal lakuna' in Sinhala.

2. Palm-leaf manuscripts in the Colombo Museum

Several manuscripts from this collection have pages numbered using Sinhala Numerals. For example, the manuscript labelled W.A.D.S./B.10 has its first page numbered with the Sinhala digit '1' (one). Page 2, numbered with the Sinhala digit '2', is also seen.

Figure 2 - Palm leaf manuscript labeled W.A.D.S./B.10 showing archaic number 1

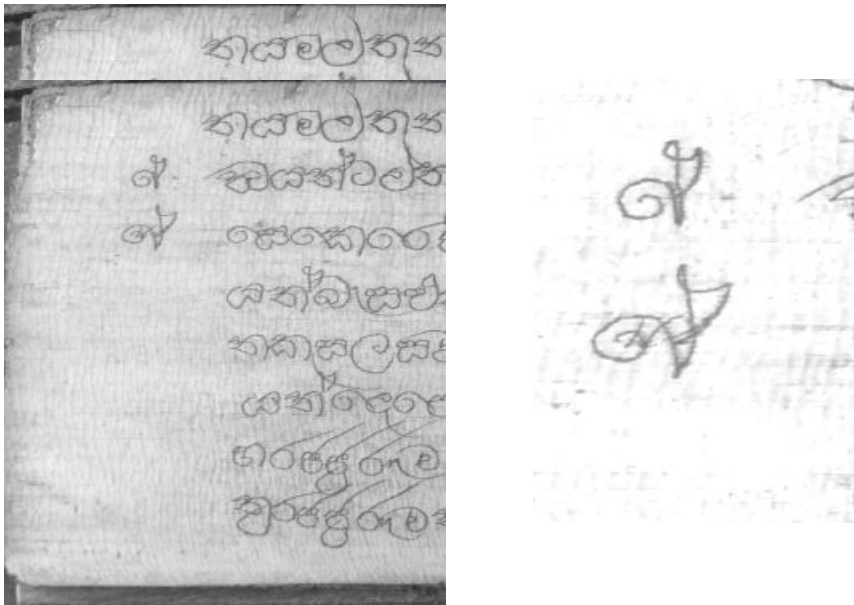Its tenth leaf is numbered '10', which is a combination of digit 1 and zero.

Figure 3 - Page 10 of W.A.D.S./B.10, and an enlargement of the page number on page 10

3. Carl Faulmann :'Das Buch der Schrift (1880 and reprinted 1990)

This also presents a distinctive digit for zero (Figure 4):

Ziffern: ⟨1 1, ∞ 2, ∞ 3, ⟨7 4, ⟨7 5, ∂ 6, Y 7, ∞ 8, ⟨ 9, ⟨7 0.

Figure 4 - Faulmann's ten digits

It is clear that Faulmann's symbol is not similar to the symbol for number 10 cited by Gunasekera and Everson. On the other hand, it is somewhat similar to number 10 of W.A.De Silva's source.
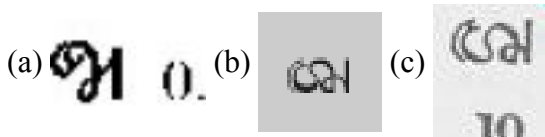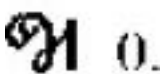
(a) ⟨7 0. (b) ⟨7 (c) ⟨7 10

Figure 5 - Comparison of digit 10 of (a) Faulmann, (b) Everson and (c) Gunasekera

In representing the symbol for zero, Faulmann may have misrepresented the sign for number 'ten' by slanting.

⟨7 0.		⟨7
Figure 6a Faulmann as it is	**Figure 6b - number10 from Palm leaf**	**Figure 6c - Slanted Faulmann**

We are confident that there will be many more instances of the use of zero digit in other archaic sources.

Not only did Sinhala have a distinctive way of writing the zero but it also had a Zero place-holder or decimal-positioning. Figure 7a represents number 11 which is a combination of digit 1 followed by another digit 1. Figure 7b represents number 13 which is a combination of digit 1 followed by digit 3.
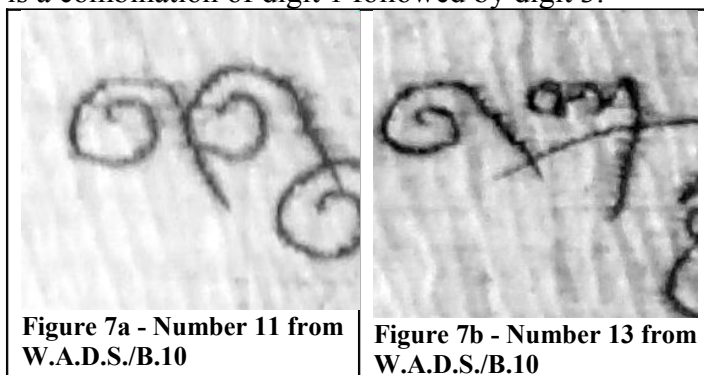
Figure 7a - Number 11 from W.A.D.S./B.10	**Figure 7b - Number 13 from W.A.D.S./B.10**

4. Evidence of Modern astrologers

Modern astrologers recognize the existence of the Sinhala zero. For example, Hendrick de Silva in his book 'Jivitaya Saha Grahayo' (Life and Planets) presents number '10' as a combination of two digits: digit 1 followed by zero. This bears similarity with the number 10 shown in Figure 3.

Figure 8 - Number 10 from Hendrick de Silva

Since we recognize that Sinhala had a unique zero as well as zero place holder, we feel that it is not necessary to include the eleven characters labelled as 'conjoined characters' in the encoding. If it is necessary they can be derived through a font like the 'conjoined letters' in the Sinhala alphabet.

Conclusion

Therefore taking consideration of the above findings the LLWG and SLSI kindly request to postpone the balloting to a subsequent meeting for which Mr. Michael Everson, ICTA and SLSI will jointly present a modified proposal.