International Journal of Mathematical Education
ISSN 0973-6948 Volume 16, Number 1 (2026) pp. 19-21
Research India Publications
https://www.ripublication.com

Redefinition of the Units of Time Measurement in Decimal System

Pradip Kumar Pal
Former Outstanding Scientist, Space Applications Centre, ISRO, India
(pradippal@rediffmail.com)

Abstract

In one earlier paper, while exploring the decimal system for time measurement, some new units of time measurement were defined based on some ancient Indian units for time, like Prahar, Muhurt and Nimesa. It is found that these units had some different meaning in ancient literature. Here these units are redefined in terms of one solar day length or the complete rotation of the Earth around its own axis,

1. Introduction

While the standard 24-hour sexagesymal system is deeply ingrained worldwide, exploring alternative systems of time measurement offers an opportunity to measure time in decimal system. In paper [1], Pal proposed one new decimal time system which can be used as a metric system by using some different units. In that paper, Nimesa was proposed as the basic unit of time. The term Nimesa [2] has been proposed as an unit of time in Sanskrit language in ancient India, but it had a different meaning than the proposed definition in paper [1]. One Muhurt has been proposed as 100 Nimesa , and one Prahar has been proposed as 100 Muhurt. The above proposed units like Muhurt and Prahar were also used in ancient India [2], but they had different values than the proposed values in paper [1].

In ancient literature, there was supposed to be 8 Prahars in a day. It means that one Prahar should be equivalent to 3 hours, whereas in paper [1], Prahar is supposed to be equivalent to 2.4 hours only.

To remove this contradiction with the ancient values, it is necessary to redefine the basic units of time measurements in the new decimal system.

2. Proposed new Units for decimal system of time measurement

The standard system divides the day into 24 hours, 60 minutes and 60 seconds. The new redefined units presents a complete, rigorous alternative : a Decimal Clock that divides the exact duration of a standard solar day (86400 SI seconds) into a seamless base-10 framework.

The system scales down the single rotation of the Earth using precise decimal intervals :

1 Day (“Diwas”) = 10 Primary Decimal Divisions (“Decidiwas”)
1 Division (“Decidiwas”) = 100 Sub-divisions (“Millidiwas”)
1 Millidiwas = 100 smaller sub-divisions (“Kalbindu”)

Total Daily Units = 100000 Smallest Fractional Units (“Kalbindu”)
The proposed new basic unit of time is Kalbindu, instead of Second. The definition of Kalbindu here is as follows.
One Kalbindu is defined as (1/100000) of the duration of mean solar day.
To perfectly synchronise with the Earth’s rotation, the duration of the smallest fractional unit (“Kalbindu”) is calibrated precisely using the following formula :
1 Kalbindu = (86400 SI seconds)/100000 = 0.864 seconds
This ensures that the decimal clock completes its full 10-unit cycle at the exact moment, a standard clock completes 24 hours, maintaining absolute temporal synchronization without drifting.

3. Discussion

As people are already habituated with the sexagecimal system, it will be difficult initially to change to new system, but the new decimal system will be easy for calculation purpose. Here in the new definition, Nimesa has been redefined as Kalbindu, Muhurt has been redefined as Millidiwas ($1/1000^{th}$ of a day) and Prahar has been redefined as Decidiwas ($1/10^{th}$ of a day).
The conversion from standard system will be as follows
1 Decidiwas = 2.4 hours
1 Millidiwas = 1.44 minutes
1 Kalbindu = 0.864 seconds
The inverse conversion will be as follows.
1 second = 1/(0.864) Kalbindu
1 minute = 1/1.44 Millidiwas
1 hour = 1/ 2.4 Decidiwas

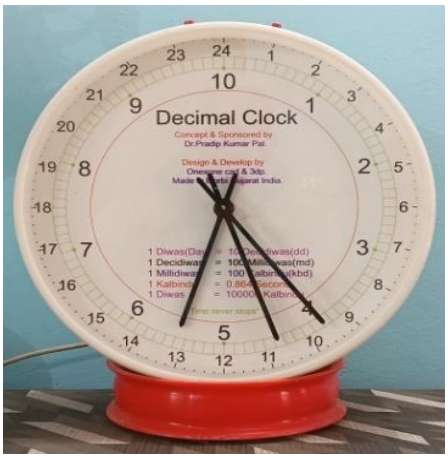

Fig.1 Decimal clock reading 5 Decidiwas 40 Millidiwas 44 Kalbindu or 5.4044 Decidiwas

On the basis of the above concept, a physical functional prototype decimal clock was built with the help of a clock maker. Though there were earlier attempts abroad, this is the first prototype decimal clock made in India.

The above decimal clock is showing 3 arms representing Decidiwas (small) , Millidiwas (medium) and Kalbindu (large) units. The new decimal clock may have 2 arms depending on the scale of measurements. The numbers in the outer circle represent 24 hours of the day. The Decidiwas arm pointing towards the number in the outer circle gives the rough idea of the time in standard 24 hour scale.

4. Conclusion

Redefinition of the units for decimal system of time measurement has been proposed to remove the contradiction of earlier proposed units in paper [1] with ancient values. A functional physical prototype decimal clock has been built for the first time in India.

5. References

1. *A new Decimal System for the Unit of Time Measurement,* Pradip Kumar Pal, International Journal of Mathematical Education, 15, 2025, p. 1-6, Research India Publication, https://dx.doi.org/10.37622/IJoME/15.1.2025.1-6
2. *The Units of Time in Ancient and Mediaval India,* Takao Hayashi, History of Science in South Asia, 51, 2017, p.1-116

Acknowledgements

The author will like to acknowledge the help of Onexone cad & 3dp at Morbi, Gujarat, India for developing the physical prototype of the decimal clock.