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Biljana Samardžija, Stevo Šegan,
Dušan Marčeta, Slaviša Milisavljević
Department of Astronomy
Faculty of Mathematics
University of Belgrade

CHRISTIAN AND MUSLIM CALENDARS IN OUR REGION: HISTORY, CALCULATION AND CONVERSION

Abstract: To improve the digital connection among Islamic and Christianity heritage in the Balkan region, we have developed several procedures for reconstruction oldest calendric rules of both confessions. Also, one part of the paper refers to the islamic prayer schedule calculation. This possibility is produced from an original algorithm for high accuracy Sun and Moon's ephemeris calculation – in the case of calendars it is a calculation of the so called cycles of the Sun and of the Moon. Regarding to civil rules and religious rules of Christianity and Islam we have generated calendars over real time intervals. The conditions for proleptic calculation are done, too. The algorithms for mutual conversion of these calendar systems and their social events are connected via Julian day number.

Key words: Calendric rules, conversion algorithms, Christian and Muslim Calendars, historical cycles, Prayer Schedule.

Introduction

In the region of the Balkan peninsula the Gregorian calendar is the official civil calendar and liturgical calendar of the catholics, but orthodox Christians has the Julian calendar as liturgical one; Muslim communities have the religious lunar calendar known as HIJRA. In accordance with Islamic calendar features and strong relations with religious history, there are two social streams (exactly: movements): traditionalists who demand acceptance of HIJRA calendar for official civil calendar and liberals who are insisting on official usage of Gregorian calendar, as an international standard.

In collecting information about specifics of the HIJRA calendar, we got relevant help from Belgrade mosque officials. They also refer us to website www.**islamicfinder**.org .

Bosnia and Herzegovina, where exists the biggest Islamic community in the Balkans, has accepted the tabular (lunar) calendar from Turkey, but for the beginning of the holy month Ramadan, the month of fasting, the observation of lunar crescent is preffered and corrections are made if necessary.

Astronomical Bases of Calendars

A calendar is a system of organizing units of time for the purpose of reckoning time over extended periods. By convention, the day is the smallest calendrical unit of time. The principal astronomical cycles are day (based on the rotation of the Earth around its axis), year (based on the revolution of the Earth around the Sun), and month (based on the revolution of the Moon around the Earth).

The common theme of calendar making is the desire to organize units of time to satisfy the needs and preoccupations of society. In addition to serving practical purposes, the process of organization provides a sense, however illusory, of understanding and controlling time itself.

As we have notified above, calendars are based on astronomical events connected with the cyclic position and motion of Sun and Moon. In that sense, among others, we recognize:

The tropical year is defined as the mean interval between vernal equinoxes; it corresponds to the cycle of the seasons. However, the interval may vary from this mean by several minutes (due to perturbation of Earth's orbit by other bodies of the Solar system).

The synodic month, the mean interval between conjunctions of the Moon and Sun, corresponds to the cycle of lunar phases. Any particular phase cycle may vary from the mean by up to seven hours.

The complexity of calendars arises because these cycles of revolution do not comprise an integral number of days, and because astronomical cycles are neither constant nor perfectly commensurable with each other.

Three distinct types of calendars have resulted from this situation:

- A **Solar calendar,** of which the Gregorian and Julian calendars are examples, ignores the movement of the Moon and only follows the movement of the Sun. The Gregorian Calendar is the most commonly used calendar and serves as international standard (Šegan, 2003) today. The goal of the Gregorian calendar is to make the average Gregorian year equal to the tropical year, so that the seasonal markers stay almost constant.
- A **Lunar calendar**, such as Islamic calendar, follows the lunar phase cycle and ignores the movement of the Sun, hence, lunar years do not follow the seasons. A lunar year of the Islamic calendar consists of 12 months, with each month beginning with the first sighting of the new moon. (Muslim calendars are based on crescent visibility and not conjunction for religious reasons.) Since the Islamic calendar is not related to the tropical year, Islamic dates move back about 11 days each year.
- A **Lunisolar calendar,** of which the Jewish and Chinese calendars are examples, aims to approximate the tropical year by adding leap months. A Lunisolar calendar consists of 12 months that begin at the new moon. A 13th month (leap month) is added a little less than every 3 years so that the calendar stays in line with the seasons. The basic unit of lunisolar calendars is the lunar month.

Map of Calendars

According to a recent estimate (Fraser, 1987), there are about forty calendars used in the world today. This interactive *Java applet*[1] (note: the opening of this applet can last a few seconds) is limited to the six principal calendars in current use. These are the Gregorian, Hebrew (Jewish), Islamic, Indian, Chinese and Julian calendars. These calendars replicate astronomical cycles according to fixed rules.

The Gregorian calendar is the most widespread civil calendar (Figure 1). Because the purpose of the Gregorian calendar was to regulate the cycle of Christian holidays, its acceptance in the non-Christian world was initially not at issue. But as international

[1] http://poincare.matf.bg.ac.rs/~dmarceta/Kalendarska%20mapa/Kalendarska%20mapa.htm

communications developed, the civil rules of the Gregorian calendar were gradually adopted around the world.

Unlike the Gregorian calendar, which serves as an international standard for civil use, there are other calendars which are used for religious and cultural purposes.

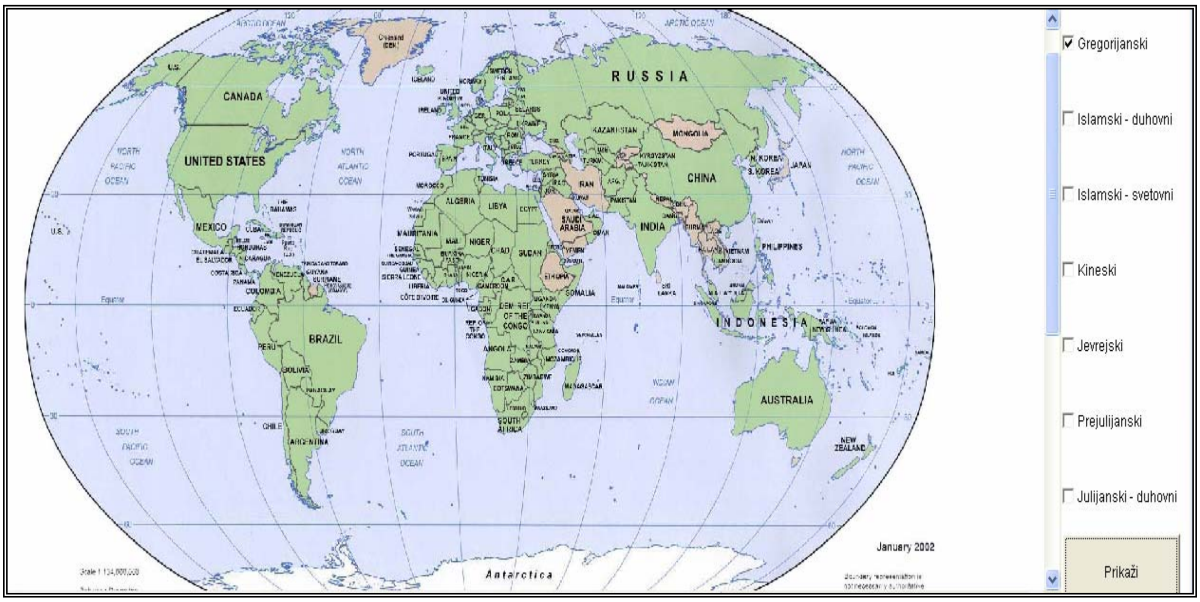

Figure 1. The use of the Gregorian calendar (marked green on the map)

For example, as we can see marked on the map (Figure 2), the Islamic calendar for religious purposes is used in Algeria, Sudan, Iran, some parts of Indonesia.

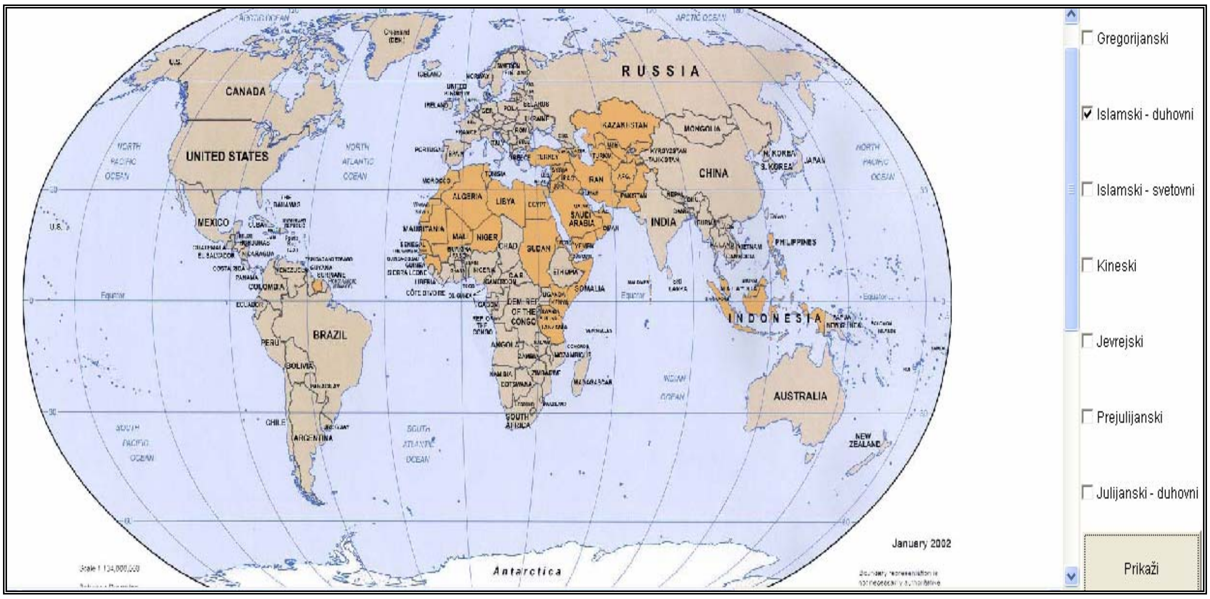

Figure 2. The use of the Islamic calendar for religious purposes (marked orange on the map)

Furthermore, the Islamic calendar for civil use is only used in Saudi Arabia and Yemen.

The Chinese have accepted the Gregorian calendar, but for their special traditional and cultural festivals they use the Chinese calendar.

The Jewish calendar is used for religious purposes by Jews all over the world, and it is the official calendar of Israel.

Ethiopia has its own Pre-Julian calendar and never adopted the Julian or Gregorian reforms.

Eventually, the Julian calendar is used for religious purpose in Russia, Egypt, Serbia, Greece, etc. to set the dates for liturgical events.

Some Facts and Important Events in the History of Christian's Calendars

The Christian's calendar has an interesting history, and has been shaped by both political ideals and a quest for greater accuracy.

There is a chart (Table 1) that graphically shows the key events shaping the calendar.

<table>
<tr><td>Roman AUC calendar</td><td rowspan="3">Julian proleptic calendar</td><td rowspan="6">Gregorian proleptic calendar</td><td>March 1st, 1. AUC (753 BC)</td><td>Start of AUC Calendar (Ab Urbe Condita or „from when Rome was founded“) with ten lunar months (March to December) each year.</td></tr>
<tr><td>Julian AUC calendar</td><td>January 1st 709 AUC (45 BC)</td><td>Start of Julian calendar with the same number of days in each month we use today, except two same dates in February;</td></tr>
<tr><td rowspan="3">End AUC</td><td>746 AUC (8 BC)</td><td>Augustus Caesar corrects the excess 366-day years by having only „normal“ 365-day years until 8 AD. Also, August now goes to the 31st, and February to the 28th. (from 8 BC to 4 AD)</td></tr>
<tr><td rowspan="6">Julian calendar</td><td>8 AD (761 AUC)</td><td>366-day „bissextile“ years start with two February 24ths, now every 4 years as originally intended.</td></tr>
<tr><td>326 AD (1079 AUC)</td><td>All Christian churches adopt a unified Easter Dating Method, OEDM.</td></tr>
<tr><td rowspan="4"></td><td>532 AD</td><td>Start of Julian AD calendar (Anno Domini or „in the year of our Lord“). Dionysius was the inventor of the Anno Domini era, which is used to number the years of both the Gregorian calendar and the Julian calendar</td></tr>
<tr><td rowspan="3">Gregorian calendar</td><td>October 1582</td><td>Gregorian calendar starts. Leap years are implemented by adding a Feb 29th to years evenly divisible by 4, but only in century years evenly divisible by 400.</td></tr>
<tr><td>1583</td><td>Revised Easter Dating Method (for Gregorian calendar), REDM</td></tr>
<tr><td>4099</td><td>The Gregorian calendar will need to skip a date in 4100 AD or shortly afterwards due to accumulating calendar inaccuracies, and the slowing rotation of Earth!</td></tr>
</table>

Table 1. Timeline of the Christian's calendars

This history starts on the „Kalends of March" or March 1st with the introduction of the Roman calendar in the year 1 A.U.C. (Ab Urbe Condita meaning "from the foundation of Rome").

1 A.U.C. is the same as 753 BC in the Julian calendar.

The Julian calendar was introduced in 709 A.U.C. (or 45 BC). It has 12 months and a simple leap rule: insert an extra day every four years. Over the centuries the date of astronomical vernal equinox slowly drifted away from the date of 21.of March (which was standardized as the date of vernal equinox). The Julian calendar has an error of 1 day every 128 years.

The Gregorian calendar today serves as an international standard for civil use (Figure 1). In addition, it regulates the ceremonial cycle of the Roman Catholic and Protestant churches. In fact, its original purpose was ecclesiastical.

The Gregorian calendar resulted from a perceived need to achieve better commensurability with the annual cycles[2] and, as a consequence of this, to reform the calculation method for the dates of Easter (L. E. Doggett). The leap rule is: century years are leap years if they are evenly divisible by 400. This calendar is so accurate that a further adjustment will not be required until 4099.

Some Facts about Islamic Calendar

Although some calendars replicate astronomical cycles according to fixed rules, others are more or less consistent with the astronomical practice. One of them is the Islamic Calendar, which is strictly a lunar calendar and months correspond to the cycle of Moon (lunar) phases. Islamic calendar months coincide with lunar cycles and because of that, months begin with the first visibility of the lunar crescent after conjunction.

Muslims begin the months with the first visibility of the lunar crescent after conjunction. Because the beginning of the month depends on observations it cannot be accurately predicted. The actual visibility of the crescent depends on weather, the optical properties of the atmosphere and the location of the observer. Due to these factors, in different parts of the world, the Ramadan (the month of fasting) starts on different dates. Those differences are usually at most one day, but can cause some problems when making appointments.

On the other side, there is a tabulated calendar that approximates the lunar phase cycle and is based on fixed rules but yet follows the phases of the Moon pretty closely. The difference between the religious and tabulated Islamic calendars is usually at most one day. The months in the tabular Islamic calendar are assumed to be alternately 30 and 29 days in length resulting in a normal calendar year of 354 days. In order to keep the calendar in step with the lunar phases every two or three years an extra day is added to the last month resulting in a calendar year of 355 days. According to the most commonly adopted method 11 intercalary days are added in every 30 years. The leap years with 355 days are 2, 5, 7, 10, 13, 16, 18, 21, 24, 26 & 29. The mean length of the month of the thirty-year tabular calendar is about 2.9 seconds less than the synodic period of the Moon.

The following table (Table 2) presents the months of the Tabular Muslim calendar. Odd-numbered months have thirty days and even-numbered months have twenty nine.

[2] Cycle of the seasons - which is the basis for the reproduction and survival of everyday human needs and activities.

1. Muharram**	30	7. Rajab**	30
2. Safar	29	8. Sha'ban	29
3. Rabi'a I	30	9. Ramadan***	30
4. Rabi'a II	29	10. Shawwal	29
5. Jumada I	30	11. Dhu al-Q'adah**	30
6. Jumada II	29	12. Dhu al-Hijjah**	29

- In a leap year, Dhu al-Hijjah has 30 days
- ** Holy months
- *** Month of fasting
- Years 2, 5, 7, 10, 13, 16, 18, 21, 24, 26, and 29 are leap years

Table 2. Islamic months

There is a disagreement among countries, religious leaders, and scientists about whether to rely on observations, which are subject to error, or to use calculations, which may be based on poor models.

History of Islamic Calendar

Al-Biruni of Kwarizm[3] (973–c. 1048 CE) wrote: "In pagan times the Arabs dealt with their months as the Moslems do now, and their pilgrimage moved through all the four seasons of the year. Then, however, they decided to fix their pilgrimage at a time when their wares, hides and fruits were ready for market; so they tried to make it immovable, to have it always in the most abundant season. So 200 years before the Hegira they learned intercalation from the Jews and, using the same method the Jews did, added the difference between their year and the solar year to the months of the year, whenever the difference had increased to a month. Then at the end of the pilgrimage ceremonies the Kalammas (the Sheiks of a certain tribe, in charge of this task) would come forward, speak to the people, and intercalate a month by giving the next month the name of the present one. People expressed their approval of the Kalammas' decision by applauding. This procedure they called Nasi, that is, shifting, because every second or third year the beginning of the year was shifted.....They could determine the right time [for Nasi] by the risings and settings of the menazil. Thus it remained up to the flight of the Prophet from Mecca to Medina."

[quoted in Ginzel, page 245]

An interesting aspect of the Islamic calendar is that it is a rare example of a people changing from a lunisolar to a lunar calendar.

As with many herding peoples, the earliest Arab calendars were lunar, but around *400 CE* they adopted a lunisolar calendar. This was because they found that the lunar calendar does not keep step with the seasons and thus, caused some difficulties. Prophet Mohammed restored the earlier calendar and announced the use of a lunar Islamic calendar without intercalation. The curiosity of Muslim calendar is that the day begins at sunset. Years of twelve lunar months are reckoned from the Era of the Hijra, commemorating the migration of the Prophet and his followers from Mecca to Medina.

[3] Abu Raihan Al-Biruni - Master Astronomer and Muslim Scholar of the Eleventh Century

Two main epochs are in use:

1. Astronomical, which starts from 15th of July 622 AD
2. Civil, which starts from 16th of July 622 AD

A lunar calendar without intercalation was introduced in 9 AH (for Latin Anno Hegirae, “in the year of the Hijra”) by the Prophet in the Qur'an (Sura IX, verse 36–37). Number and position of intercalary months between 1 AH-10 AH (622–632 AD) is uncertain.

The Hijra Era was established in 17 A.H by Caliph 'Umar I. It is not known how the initial date was determined, but calculations show that the astronomical New Moon (i.e., conjunction) occurred on +622 July 14 at 04:44 UT (assuming AT = 1.0 hour), so that sighting of the crescent most likely occurred in the evening of July 16.

Visibility of the Crescent Moon

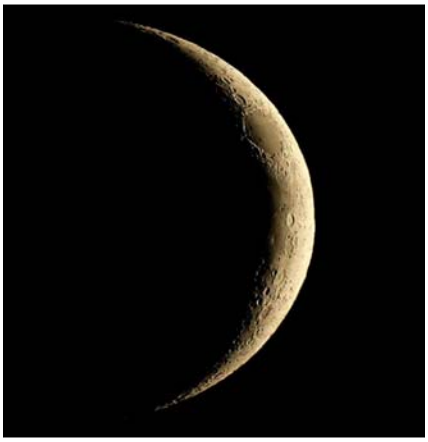

Figure 3. Crescent Moon

The earliest known visibility tables are by Al-Biruni of Kwarizm, were based on the Indian observation that the Moon will be visible if the local hour angle of the Moon at sunset is equal to or less than 78 degrees. Under optimal conditions, the crescent Moon has been sighted about 15.4 hours after the astronomical New Moon (i.e., conjunction) (Schaefer, 1988)

Usually, however, it is not seen until it is more than twenty-four hours old. Babylonian astronomers were the first to develop methods for calculating first visibility, though no surviving tables are explicitly concerned with this (Neugebauer, 1975). With the development of Islamic astronomy, more complex criteria were also developed by Muslim astronomers. Modern models for predicting first visibility incorporate celestial mechanics, spherical astronomy, selenology, atmospheric physics, and ophthalmology. Bruin (1977) was the first to prepare such a model. Ilyas (1984), recognizing that the Islamic calendar is used around the world, introduced the concept of an "International Lunar Dateline," west of which the Moon should be visible under good observing conditions. Further theoretical work has been done by Schaefer (1988). Extensive observing programs have been organized by Doggett, Seidelmann, and Schaefer (1988) and Doggett and Schaefer (1989).

Conversion between Calendars

There are *mathematical formulas*[4] for conversion between different calendars. Since Christian calendars are based on similar astronomical base, the conversion between them is rather simple. The conversion between Christian and Muslim calendars is more complex because they are based on different astronomical cycles. For the purposes of computer calculation (or digitization of some printed material) one linear time scale allows us to perform calculation and conversion very easily between incommensurable calendars. Such a linear system for dealing with time exists and has been used by astronomers for years. It is called the **J**ulian **D**ay number (**JD**). There are some auxiliary steps to get day (D), month (M) and year (G) of Islamic calendar from Julian day which can be calculated from Gregorian date.

[4] http://poincare.matf.bg.ac.rs/~dmarceta/Kalendari/default.html

Note: Algorithm for reproduction of Julian calendar is significantly simpler than those of the Gregorian calendar, especially for religious holidays, so it has not an extensive attention in this paper.

$$L = JD - JD0 + 10632$$
$$N = [(L - 1)/10631]$$
$$L = L - 10631 \times N + 354$$
$$J = [(10985 - L)/5316] \times [(50 \times L)/17719] + [L/5670] \times [(43 \times L)/15238]$$
$$L = L - [(30 - J)/15] \times [(17719 \times J)/50] - [J/16] \times [(15238 \times J)/43] + 29$$
$$M = [(24 \times L)/709]$$
$$D = L - [(709 \times M)/24]$$
$$G = 30 \times N + J - 30$$

where JD0 = 1948440 (16 July 622).

How to Calculate Prayer Schedule – Vaktija[5]

A special kind of calendar, which specifies the start of prayer times and their duration, is called **Vaktija.**

Muslims observe five formal prayers everz day. In ancient times, one merely looked at the Sun to determine the various times of day for a prayer. In modern times, daily prayer schedules are often printed which precisely pinpoint the beginning of each prayer time.

There are five prayer times (www.islamicfinder.org) which are calculated according to relative position of the Sun to the horizon:

- **Fajr** (Morning) – between the very beginning of dawn and sunrise[6]
- **Dhuhr** (Noon) – between the declining of the Sun & Asr (when the shadow of something is twice its own length)
- **'Asr** (Afternoon) – immediately after the last time limit of Dhuhr until (just before) the sunset
- **Maghrib** (Evening) – soon after the sunset until the disappearance of the twilight
- **'Isha** (Night) – after the disappearance of the twilight until midnight

Different Islamic societies use different astronomical conventions (Table 3) for calculation of prayer times (dawn and night). These conventions define beginning of morning and beginning of evening by angles of the Sun below eastern or western horizon. From astronomical point of view, the only real and serious criterion for making lunar calendar, especially for calendar that has significant requirements regarding schedule of religious rituals, is the hour angle of the Sun of 78 degrees, for a given meridian. If this condition is transformed from local equatorial to horizontal reference frame (azimuth and elevation of the Sun), it is easy to identify coordinate base for each of stated conventions, and the difference between adopted angle criteria for the moments of beginning of twilight.

None of these conventions can be used in the Polar Regions because in those regions in some part of the year the Sun can always be above or below the horizon and some of criteria from convention can never be reached. The difference between these organizations lies in determining the time of the Dawn and Night Prayers. Astronomical convention accepted by

[5] http://poincare.matf.bg.ac.rs/~dmarceta/Takvimi/

[6] **Shurooq** is the time of sunrise, the time when the upper limb of the Sun just starts to appear above the horizon; this marks the end time for Fajr (morning) prayer

International Astronomical Union (IAU) uses angles of 18 degrees which is the same as the convention of University of Islamic Sciences, Karachi.

Organization	Angle of the Sun under the Horizon (Fajr)	Angle of the Sun under the Horizon ('Isha)	Region
Shia Ithna Ashari (Jafari)	16	14	West of central Arabia.
Islamic Society of North America (ISNA)	15	15	Parts of the USA, Canada, Parts of the UK
Muslim World League (MWL)	18	17	Europe, The Far East, Parts of the USA
Umm al-Qura, Makkah	18.5	90 mins after Maghrib, 120 mins during Ramadan	The Arabian Peninsula
Egyptian General Authority of Survey	19.5	17.5	Africa, Syria, Iraq, Lebanon, Malaysia, Parts of the USA
University of Islamic Sciences, Karachi	18	18	Pakistan, Bangladesh, India, Afghanistan, Parts of Europe

Table 3. Conventions

Prayer Times

During our research, we made a program *Prayer Times*[7] *(Figure 4.)*, which calculates the start of prayer times and their duration for different conventions and for arbitrary geographic coordinates. This program enables the efficient digitization of printed material known as *Takvim*.

All *prayer times*[8] are calculated according to the Sun position while the Calendar itself is strictly lunar. This result can be obtained for every point on the Earth where these astronomical phenomena take place, unlike other programs that calculate prayer times which are limited to certain places (cities). This, of course, excludes regions with latitude above 48 degrees or so (depending on convention) where some of these phenomena don't happen in some part of the year. Also, this

Figure 4. Program for calculation of prayer times

[7] http://poincare.matf.bg.ac.rs/~dmarceta/Prayer%20times/

[8] http://poincare.matf.bg.ac.rs/~dmarceta/Prayer%20times/Calculation%20of%20the%20Prayer%20Times%202011.xls

program can calculate prayer times for 6 different conventions that are widely used, and in that sense it is universal.

The timing of these five prayers varies from place to place and from day to day. It is obligatory for Muslims to perform these prayers at the correct time.

The prayer times for any given location on earth may be determined mathematically if the latitude and longitude of the location are known. However, the theoretical determination of prayer times is a lengthy process. Much of this tedium may be alleviated by using computer programs.

This example is taken for Sarajevo for current year and convention MWL (Muslim World League).

Below is a scanned page from the Muslim prayer schedule for June 2010. (Figure 5)

JUNI 2010.

(DŽUMADE-L-UHRA/ REDŽEB 1431. GOD. PO H.)

DAN			Blagdani, značajni datumi, faze Mjeseca i drugi astronomski podaci	Zora		Izlazak Sunca		Podne		Ikindija		Akšam (zalazak Sunca)		Jacija		Kibla-sat	
Po kalendaru	U sedmici	Po takvimu		s	m	s	m	s	m	s	m	s	m	s	m	s	m
1	Ut	18	Džumade-l-uhra 1431.	2	39	5	01	12	45	16	49	20	27	22	27	11	20
2	Sr	19	Dan brige IZ-e za slijepe i slabovidne osobe		38		00		45		49		28		29		21
3	Če	20			36		00		45		49		28		30		21
4	Pe	21	Džuma. Posljednja četvrt 22:13		35	4	59		45		49		29		32		22
5	Su	22			34		59		46		50		30		34		22
6	Ne	23			33		58		46		51		31		35		23
7	Po	24			32		58		46		51		31		36		23
8	Ut	25			31		57		46		51		32		37		24
9	Sr	26			30		57		46		51		33		38		24
10	Če	27			30		57		47		52		33		38		25
11	Pe	28	Džuma		29		57		47		52		34		39		25
12	Su	29	Mijena 11:16		28		57		47		53		34		40		25
13	Ne	1	Redžeb 1431.		27		56		47		53		35		41		26
14	Po	2	Haziran		27		56		47		54		36		42		26
15	Ut	3			27		56		48		54		36		42		27
16	Sr	4			27		56		48		54		36		42		27
17	Če	5	Lejletu-r-regaib		27		56		48		54		37		43		27
18	Pe	6	Džuma		27		56		48		54		37		43		27
19	Su	7	Prva četvrt 04:29		26		56		48		54		38		44		28
20	Ne	8			26		57		49		55		38		45		28
21	Po	9			26		57		49		55		38		45		28
22	Ut	10			27		57		49		55		38		45		28
23	Sr	11			27		57		49		55		38		44		29
24	Če	12			28		58		49		55		38		44		29
25	Pe	13	Džuma		28		58		49		55		39		44		29
26	Su	14	Pun Mjesec 11:30		29		59		50		56		39		44		29
27	Ne	15	Ajvatovica		30		59		50		56		39		44		29
28	Po	16			31		59		50		56		39		44		29
29	Ut	17			32	5	00		50		56		38		43		29
30	Sr	18		2	32	5	00	12	50	16	56	20	38	22	43	11	29

336 takvim za **2010.**

U Bosni i Hercegovini se obično klanja prva ikindija, a u Makedoniji, Crnoj Gori i na Kosovu se klanja druga ikindija.

Zalazak Sunca je početak akšamskog vremena (*magrib*). Vrijeme zalaska Sunca nastaje kada Sunce, tj. njegov gornji rub, potpuno zađe pod horizont mjesta ili kada se centar Sunca spusti ispod horizonta za 16' 1,5" (koliki je ugaoni radijus Sunca) pri čemu se uzima da je horizontalna refrakcija 34'. U ovom Takvimu je na vrijeme zalaska Sunca dodan *temkin* od 6 minuta (za relativnu nadmorsku visinu od 920 m) zbog toga što se akšam ne može klanjati ako se vidi obasjan vrh nekog susjednog brda.

Jacija (*'išâ'*) nastaje kada se središte Sunca spusti 17° ispod zapadnog horizonta. To je prva jacija, koja se klanja u Bosni i Hercegovini. Druga jacija nastupa kasnije, kada se središte Sunca spusti 19° ispod zapadnog horizonta.

Zora (*fedžr*) nastaje kada se središte Sunca nalazi 19° ispod istočnog horizonta, tj. od rađanja prâve zore i traje do izlaska Sunca.

Izlazak Sunca je čas prestanka sabahskog vremena, računat je sa *temkinom* od 6 minuta (za relativnu nadmorsku visinu od 920 m), pa je izlazak Sunca 6 minuta raniji nego u astronomskim godišnjacima.

Dnevni post (*imsâk*) počinje neposredno prije rađanja zore i traje do zalaska Sunca (akšama).

Bajram-namaz počinje 45 minuta nakon izlaska Sunca (ali se može klanjati i 30 minuta nakon izlaska Sunca).

Džuma-namaz je u vrijeme podnevskog vakta.

310 takvim za **2010.**

Figure 5. Example of Takvim content

Conclusion

The purpose of the digitization is to encourage research of Islam and to facilitate dissemination of knowledge to locations where such resources are not commonly or easily accessible.

In this paper we tried to call attention to some problems, but also, to some possibilities of establishing the link between Christian and Islamic calendar. In our region, that link could be important from the historical and contemporary viewpoint.

In that sense, the result of the program presented in this paper can be used not only as a scrutiny of that link, but, to identify possible failures, as well.

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biljanas@alas.matf.bg.ac.rs
sam.biljana@gmail.com