Programming Planck units from a virtual electron; a Simulation Hypothesis

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The Simulation Hypothesis proposes that all of reality, including the earth and the universe, is in fact an artificial simulation, analogous to a computer simulation, and as such our reality is an illusion. In this essay I describe a method for programming units of mass, space, time and charge as geometrical objects from a virtual electron. As objects they are independent of any set of units and also of any numbering system. The virtual electron is a mathematical formula $f_e = 4\pi^2 r^3$ ($r = 2^6 3\pi^2 \alpha\Omega^5$) that is a construct of 2 unit-less constants; the fine structure constant α = 137.03599... and Ω = 2.00713494... thus r is also unit-less. The units mass, time, length, ampere (MTLA) are not independent units but overlap and cancel (units = 1) in these ratio M^9T^{11}/L^{15} and $(AL)^3/T$. These ratio are embedded within f_e giving geometries M = (1), T = (2π), L = ($2\pi^2\Omega^2$), A = $(4\pi\Omega)^3/\alpha$. These units are formalized in an array structure u that assigns relationships between them; mass = u^{15}, length = u^{-13}, time = u^{-30}, ampere = u^3. Velocity V would then become V = 2L/T = ($2\pi\Omega^2$, u^{17}). To translate MLTA from the above unit-less (α, Ω) geometries to their respective SI (or imperial) Planck unit values requires an additional 2 unit-dependent scalars. We may thereby derive the physical constants (G, h, e, c, m_e, k_B) via 2 (fixed) mathematical constants, 2 (variable) unit scalars and the reference unit u. Results are consistent with CODATA 2014.

Table 1	Calculated values from (α, Ω, k, t) [11]	CODATA 2014
Speed of light	$c^* = 299792458\ u^{17}$	$c = 299792458$
Permeability	$\mu_0{}^* = 4\pi/10^7\ u^{56}$	$\mu_0 = 4\pi/10^7$
Rydberg constant	$R_\infty{}^* = 10973731.568\ 508\ u^{13}$	$R_\infty = 10973731.568\ 508(65)$ [15]
Planck constant	$h^* = 6.626\ 069\ 134$ e-34 u^{19}	$h = 6.626\ 070\ 040(81)$ e-34 [16]
Elementary charge	$e^* = 1.602\ 176\ 511\ 30$ e-19 u^{-27}	$e = 1.602\ 176\ 6208(98)$ e-19 [19]
Electron mass	$m_e^* = 9.109\ 382\ 312\ 56$ e-31 u^{15}	$m_e = 9.109\ 383\ 56(11)$ e-31 [17]
Boltzmann's constant	$k_B^* = 1.379\ 510\ 147\ 52$ e-23 u^{29}	$k_B = 1.380\ 648\ 52(79)$ e-23 [22]
Gravitation constant	$G^* = 6.672\ 497\ 192\ 29$ e-11 u^6	$G = 6.674\ 08(31)$ e-11 [21]

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1 Background

Max Tegmark proposed a Mathematical Universe Hypothesis that states: Our external physical reality is a mathematical structure. That is, the physical universe is mathematics in a well-defined sense, and in those [worlds] complex enough to contain self-aware substructures [they] will subjectively perceive themselves as existing in a physically 'real' world" [10].

Mathematical Platonism is a metaphysical view that there are abstract mathematical objects whose existence is independent of us [1]. Mathematical realism holds that mathematical entities exist independently of the human mind. Thus humans do not invent mathematics, but rather discover it. Triangles, for example, are real entities, not the creations of the human mind [3].

The Simulation Hypothesis proposes that all of reality, including the earth and the universe, is in fact an artificial simulation, analogous to a computer simulation [2].

Science uses 5 units; mass, length, time, charge (ampere) and temperature (kelvin) to measure the physical universe. In SI units they are (kg, m, s, A, k). These units are associated with physical constants (the dimensioned constants) such as (G, h, e, c, m_e, k_B). There are also dimensionless constants such as π and the fine structure constant alpha which are not associated with any units.

In the "Trialogue on the number of fundamental physical constants" was debated the number of fundamental dimension units required, noting that "There are two kinds of fundamental constants of Nature: dimensionless (α) and dimensionful (c, h, G). To clarify the discussion I suggest to refer to the former as fundamental parameters and the latter as fundamental (or basic) units. It is necessary and sufficient to have three basic units in order to reproduce in an experimentally meaningful way the dimensions of all physical quantities. Theoretical equations describing the physical world deal with dimensionless quantities and their solutions depend on dimensionless fundamental parameters. But experiments, from which these theories are extracted and by which they could be tested, involve measurements, i.e. comparisons with standard dimensionful scales. Without standard dimensionful units and hence without certain conventions physics is unthinkable" -*Trialogue* [5].

Planck units (Planck mass m_P, Planck length l_p, Planck time t_p, Planck ampere A_p, Planck temperature T_P) are a set of natural units of measurement defined exclusively in terms of five universal physical constants, in such a manner that these five physical constants take on the numerical value of $G = \hbar = c = 1/4\pi\epsilon_0 = k_B = 1$ when expressed in terms of these units. These units are also known as natural units because the origin of their definition comes only from properties of nature and not from any human construct. Max Planck [10] wrote of these units; "we get the possibility to establish units for length, mass, time and temperature which, being independent of specific bodies or substances, retain their meaning for all times and all cultures, even non-terrestrial and non-human ones and could therefore serve as natural units of measurements...".

2 Simulated units

Our 'physical' universe is defined in terms of fundamental measurable quantities which we measure using the SI units or imperial unit equivalents and assign them to (dimensioned) physical constants that we use as reference, for example all velocities may be measured relative to c. These units however are terrestrial units, although Max Planck proposed a set of natural units, the Planck units, his units are still measured in terrestrial terms; Planck mass m_P = 2.17647... x10^{-8} kg or 4.79825... x10^{-8} lbs.

Mathematical universe hypotheses presume that our physical universe has an underlying mathematical origin. The principal difficulty of such hypotheses lies in the problem of how to construct these physical units, the units that confer 'physical-ness' to our universe, from their respective mathematical forms. In the following I describe a system of units that is based on geometrical objects and so is independent of any particular system of units and also of any numbering system, yet may be used to reproduce our physical constants (see table p1). The model is based on a virtual (unit-less) electron formula f_e from which natural units of mass M, length L, time T and charge A (ampere) may be derived.

$$f_e = 4\pi^2(2^6 3\pi^2\alpha\Omega^5)^3 = .23895453...x10^{23},\ units = 1 \quad (1)$$

The fine structure constant α (4.5.) and a recurring number Ω (4.7.) are unit-less mathematical constants and so f_e is also a mathematical constant (units = 1). In terms of the units ATV (a hypothetical magnetic monopole), f_e can be written;

$$f_e = (\frac{3\alpha^2 ATV}{2\pi^2})^3 \frac{1}{T} = .23895453...x10^{23},\ units = 1 \quad (2)$$

We could solve this equation using the SI constants A = ampere = e/t_p, T = Planck time t_p and V = c. We note that as f_e is dimensionless, this requires that this ATV ratio embedded within f_e must likewise be dimensionless (units = 1).

$$f_e\ units;\ (ATV)^3/T = (AL)^3/T = \sqrt{(M^9T^{11}/L^{15})}\ ... = 1 \quad (3)$$

The SI ATV constants use our terrestrial values yet the numerical value for f_e has a fixed value, thus our terrestrial values must somehow cancel each other. We can therefore look for a solution for MLTA that is expressed solely in terms of (α, Ω) and thus would be unit-independent. For example;

$$M = (1) \quad (4)$$

$$T = (2\pi) \quad (5)$$

$$P = (\Omega) \quad (6)$$

$$V = (2\pi\Omega^2) \quad (7)$$

$$L = (2\pi^2\Omega^2) \quad (8)$$

$$A = (\frac{2^6\pi^3\Omega^3}{\alpha}) \quad (9)$$

3 Unit u

If the mass, space, time and charge units overlap and cancel within f_e then they are not independent of each other. I assigned an array structure u that defines the relationships between them.

u^{15} (mass)
u^{-30} (time)
u^{-13} (length)
u^3 (ampere)

We can construct a table of units, for example;
Velocity V = length/time = $u^{-13+30=17}$
Elementary charge = ampere x time = $u^{3-30=-27}$

4 Scalars

4.1. In order to translate from the unit-less MLTA geometries to any chosen system of units such as SI units (kg, m, s, A, k) requires 2 (dimensioned) scalars. Here I assign scalars $kltvpa$ with their corresponding unit u.

$$k,\ unit = u^{15}\ (mass) \quad (10)$$

$$t,\ unit = u^{-30}\ (time) \quad (11)$$

$$p,\ unit = u^{16}\ (sqrt\ of\ momentum) \quad (12)$$

$$v,\ unit = u^{17}\ (velocity) \quad (13)$$

$$l,\ unit = u^{-13}\ (length) \quad (14)$$

$$a,\ unit = u^3\ (ampere) \quad (15)$$

The formulas for MLTVPA now become;

$$M = (1)k,\ unit = u^{15}\ (mass) \quad (16)$$

$$T = (2\pi)t,\ unit = u^{-30}\ (time) \quad (17)$$

$$P = (\Omega)p,\ unit = u^{16}\ (sqrt\ of\ momentum) \quad (18)$$

$$V = (2\pi\Omega^2)v,\ unit = u^{17}\ (velocity) \quad (19)$$

$$L = (2\pi^2\Omega^2)l,\ unit = u^{-13}\ (length) \tag{20}$$

$$A = (\frac{2^6\pi^3\Omega^3}{\alpha})a,\ unit = u^3\ (ampere) \tag{21}$$

4.2.1. However only 2 of these 6 *kltvpa* scalars are required to define the other 4. In this example I derive LPVA from MT. The formulas for MT;

$$M = (1)k,\ unit = u^{15} \tag{22}$$

$$T = (2\pi)t,\ unit = u^{-30} \tag{23}$$

From the eq(3) ratio ($M^9T^{11} = L^{15}$ ...) we get PVLA;

$$P = (\Omega)\ \frac{k^{12/15}}{t^{2/15}},\ unit = u^{12/15*15-2/15*(-30)=16} \tag{24}$$

$$V = \frac{2\pi P^2}{M} = (2\pi\Omega^2)\ \frac{k^{9/15}}{t^{4/15}},\ unit = u^{9/15*15-4/15*(-30)=17} \tag{25}$$

$$L = \frac{TV}{2} = (2\pi^2\Omega^2)\ k^{9/15}t^{11/15},\ unit = u^{9/15*15+11/15*(-30)=-13} \tag{26}$$

$$A = \frac{8V^3}{\alpha P^3} = \left(\frac{64\pi^3\Omega^3}{\alpha}\right)\ \frac{1}{k^{3/5}t^{2/5}},\ unit = u^{9/15*(-15)+6/15*30=3} \tag{27}$$

4.2.2. In this example I derive MLTA from PV;

$$P = (\Omega)p,\ unit = u^{16} \tag{28}$$

$$V = (2\pi\Omega^2)v,\ unit = u^{17} \tag{29}$$

MTVA in terms of PV

$$M = \frac{2\pi P^2}{V} = (1)\frac{p^2}{v},\ unit = u^{16*2-17=15} \tag{30}$$

$$T^2 = (2\pi\Omega)^{15}\frac{P^9}{2\pi V^{12}} \tag{31}$$

$$T = (2\pi)\frac{p^{9/2}}{v^6},\ unit = u^{16*9/2-17*6=-30} \tag{32}$$

$$L = \frac{TV}{2} = (2\pi^2\Omega^2)\frac{p^{9/2}}{v^5},\ unit = u^{16*9/2-17*5=-13} \tag{33}$$

$$A = \frac{8V^3}{\alpha P^3} = (\frac{2^6\pi^3\Omega^3}{\alpha})\frac{v^3}{p^3},\ unit = u^{17*3-16*3=3} \tag{34}$$

Assigning SI numerical values to (p, v) gives us solutions for the Planck units (M=m_P, L=l_p, T=t_p, V=c).

$$p = 0.507745336...\ u^{16},\ (\sqrt{kg.m/s})$$

$$v = 11843707.9...\ u^{17},\ (m/s)$$

From these Planck units we can now solve the physical constants G, h, e, m_e, k_B. To maintain integer exponents (for clarity) I replace p with $r = \sqrt{p}$, unit $u^{16/2=8}$

$$G^* = \frac{V^2L}{M} = 2^3\pi^4\Omega^6\frac{r^5}{v^2},\ u^{34-13-15=8*5-17*2=6} \tag{35}$$

$$h^* = 2\pi MVL = 2^3\pi^4\Omega^4\frac{r^{13}}{v^5},\ u^{15+17-13=8*13-17*5=19} \tag{36}$$

$$T_P^* = \frac{AV}{\pi} = \frac{2^7\pi^3\Omega^5}{\alpha}\frac{v^4}{r^6},\ u^{3+17=17*4-6*8=20} \tag{37}$$

$$e^* = AT = \frac{2^7\pi^4\Omega^3}{\alpha}\frac{r^3}{v^3},\ u^{3-30=3*8-17*3=-27} \tag{38}$$

$$k_B^* = \frac{\pi VM}{A} = \frac{\alpha}{2^5\pi\Omega}\frac{r^{10}}{v^3},\ u^{17+15-3=10*8-17*3=29} \tag{39}$$

$$m_e^* = \frac{M}{f_e},\ u^{15} \tag{40}$$

$$\lambda_e^* = 2\pi Lf_e,\ u^{-13} \tag{41}$$

$$\mu_0^* = \frac{\pi V^2M}{\alpha LA^2} = \frac{\alpha}{2^{11}\pi^5\Omega^4}r^7,\ u^{17*2+15+13-6=7*8=56} \tag{42}$$

$$\epsilon_0^{*-1} = \frac{\alpha}{2^9\pi^3}v^2r^7,\ u^{34+56=90} \tag{43}$$

$$r_\sigma^* = (\frac{8\pi^5k_B^4}{15h^3c^3}) = \frac{\alpha}{2^{29}15\pi^{14}\Omega^{22}}r,\ u^{29*4-19*3-17*3=8} \tag{44}$$

$$R^* = (\frac{m_e}{4\pi l_p\alpha^2 m_P}) = \frac{1}{2^{23}3^3\pi^{11}\alpha^5\Omega^{17}}\frac{v^5}{r^9},\ u^{13} \tag{45}$$

As (α, Ω) have fixed values, I need only assign numerical values to 2 of the scalars, here I used r and v (4.6.), in order to solve (G, h, e, c, m_e, k_B) yet as we see in the table on page 1, the results agree with CODATA 2014, the repository for generally accepted values.

4.3. We then find that by assigning SI values to *klta* whereby M = m_P, T = t_p, L = l_p, A = $A_p = e/t_p$, these *klta* scalars cancel within the electron f_e ratios; $M^9T^{11}/L^{15} = (AL)^3/T$, leaving only the unit-less (α, Ω) geometries. Consequently these ratios must be independent of the system of units used, to quote Max Planck 'whether terrestrial or alien'. Setting *klta* numerical values to give the SI Planck units, we find;

$$k = m_P = .21767281758...\ 10^{-7},\ u^{15}\ (kg) \tag{46}$$

$$t = \frac{t_p}{2\pi} = .17158551284...10^{-43},\ u^{-30}\ (s) \tag{47}$$

$$l = \frac{l_p}{2\pi^2\Omega^2} = .20322086948...10^{-36},\ u^{-13}\ (m) \tag{48}$$

$$a = \frac{A_p\alpha}{64\pi^3\Omega^3} = .12691858859...10^{23},\ u^3\ (A) \tag{49}$$

The scalars cancel leaving the (α, Ω) geometries;

$$\frac{L^{15}}{M^9T^{11}} = \frac{l_p^{15}}{m_P^9t_p^{11}} = \frac{(2\pi^2\Omega^2)^{15}}{(1)^9(2\pi)^{11}}.\frac{l^{15}}{k^9t^{11}} = 2^4\pi^{19}\Omega^{30} \tag{50}$$

$$\frac{l^{15}}{k^9t^{11}} = \frac{(.203...x10^{-36})^{15}}{(.217...x10^{-7})^9(.171...x10^{-43})^{11}}\frac{u^{-13*15}}{u^{15*9}u^{-30*11}} = 1 \tag{51}$$

$$\frac{A^3L^3}{T} = \frac{A_p^3 l_p^3}{t_p} = \frac{(2^6\pi^3\Omega^3)^3(2\pi^2\Omega^2)^3}{(\alpha)^3(2\pi)} . \frac{a^3 l^3}{t} = \frac{2^{20}\pi^{14}\Omega^{15}}{\alpha^3} \tag{52}$$

$$\frac{a^3 l^3}{t} = \frac{(.126...x10^{23})^3(.203...x10^{-36})^3}{(.171...x10^{-43})} \frac{u^{3*3}u^{-13*3}}{u^{-30}} = 1 \tag{53}$$

In 4.2.2. I defined MLTA in terms of PV. Replacing MLTA with those PV derivations, we find that P and V themselves cancel leaving only the dimensionless components. In the unit-less ratios we find a commonality of Ω^{15}.

$$\frac{L^{30}}{M^{18}T^{22}} = \frac{2^{180}\pi^{210}\Omega^{225}P^{135}}{V^{150}} / \frac{2^{18}\pi^{18}P^{36}}{V^{18}} . \frac{2^{154}\pi^{154}\Omega^{165}P^{99}}{V^{132}} \tag{54}$$

$$\frac{L^{30}}{M^{18}T^{22}} = (2^4\pi^{19}\Omega^{30})^2 \tag{55}$$

$$\frac{A^6L^6}{T^2} = \frac{2^{18}V^{18}}{\alpha^6 P^{18}} . \frac{2^{36}\pi^{42}\Omega^{45}P^{27}}{V^{30}} / \frac{2^{14}\pi^{14}\Omega^{15}P^9}{V^{12}} \tag{56}$$

$$\frac{A^6L^6}{T^2} = (\frac{2^{20}\pi^{14}\Omega^{15}}{\alpha^3})^2 \tag{57}$$

4.4. The electron formula f_e is both unit-less and non scalable $v^0 r^0 u^0 = 1$. It is therefore a natural (mathematical) constant, σ_e is a hypothetical monopole, σ_{tp} a hypothetical temperature monopole.

$$T = (2\pi)\frac{r^9}{v^6},\ u^{-30} \tag{58}$$

$$\sigma_e = \frac{3\alpha^2 AL}{\pi^2} = 2^7 3\pi^3\alpha\Omega^5\frac{r^3}{v^2},\ u^{-10} \tag{59}$$

$$f_e = \frac{\sigma_e^3}{T} = \frac{(2^7 3\pi^3\alpha\Omega^5)^3}{2\pi},\ units = \frac{(u^{-10})^3}{u^{-30}} = 1 \tag{60}$$

$$\sigma_{tp} = \frac{3\alpha^2 T_P}{2\pi} = 2^6 3\pi^2\alpha\Omega^5\frac{v^4}{r^6},\ units = u^{20} \tag{61}$$

$$f_e = t_p^2\sigma_{tp}^3 = 4\pi^2(2^6 3\pi^2\alpha\Omega^5)^3,\ units = (u^{-30})^2(u^{20})^3 = 1 \tag{62}$$

4.5. The Sommerfeld fine structure constant alpha is a dimensionless mathematical constant. The following uses a well known formula for alpha (note: for convenience I use the commonly recognized value for alpha as $\alpha \sim 137$);

$$\alpha = \frac{2h}{\mu_0 e^2 c} \tag{63}$$

$$\alpha = 2(8\pi^4\Omega^4)/(\frac{\alpha}{2^{11}\pi^5\Omega^4})(\frac{128\pi^4\Omega^3}{\alpha})^2(2\pi\Omega^2) = \alpha \tag{64}$$

$$scalars = \frac{r^{13}}{v^5} . \frac{1}{r^7} . \frac{v^6}{r^6} . \frac{1}{v} = 1 \tag{65}$$

$$units = \frac{u^{19}}{u^{56}(u^{-27})^2 u^{17}} = 1 \tag{66}$$

4.6. The Planck units are known with a low numerical precision, 1 reason why they are not commonly used. Conversely 2 of the physical constants have been assigned exact numerical values; the speed of light $c = 299792458\ m/s$ and the permeability of vacuum $\mu_0 = 4\pi/10^7\ kg.m/s^2.A^2$. Thus scalars r and v were used (4.2.2.) as they can be derived from c and μ_0.

$$v = \frac{c}{2\pi\Omega^2} = 11843707.9...,\ units = m/s \tag{67}$$

$$r^7 = \frac{2^{11}\pi^5\Omega^4\mu_0}{\alpha};\ r = .712562514...,\ units = (\frac{kg.m}{s})^{1/4} \tag{68}$$

The most precise of the experimentally measured constants is the Rydberg $R = 10973731.568508(65)\ m^{-1}$. We use these 3 constants (c^*, μ_0^*, R^*) from the formulas in 4.2. to solve less precise constants. Here I combine them into a unit-less ratio;

$$\frac{(c^*)^{35}}{(\mu_0^*)^9(R^*)^7},\ units = \frac{(u^{17})^{35}}{(u^{56})^9(u^{13})^7} = 1 \tag{69}$$

$$\frac{(c^*)^{35}}{(\mu_0^*)^9(R^*)^7} = (2\pi\Omega^2)^{35}/(\frac{\alpha}{2^{11}\pi^5\Omega^4})^9.(\frac{1}{2^{23}3^3\pi^{11}\alpha^5\Omega^{17}})^7 \tag{70}$$

4.7. I have premised a 2nd mathematical constant I denoted $\Omega = 2.0071349496...$;. We can find a solution for Ω using the geometries for (c^*, μ_0^*, R^*) and then numerically solve by replacing the geometrical (c^*, μ_0^*, R^*) with the numerical (c, μ_0, R) CODATA values. Rewriting eq.70 in terms of Ω;

$$\Omega^{225} = \frac{(c^*)^{35}}{2^{295}3^{21}\pi^{157}(\mu_0^*)^9(R^*)^7\alpha^{26}},\ units = 1 \tag{71}$$

$$\Omega = 2.007\ 134\ 9496...,\ units = 1 \tag{72}$$

There is a close natural number for Ω that is a sqrt implying that Ω can have a plus and a minus solution; $(+\Omega)^2 = (-\Omega)^2$.

$$\Omega = \sqrt{\left(\frac{\pi^e}{e^{(e-1)}}\right)} = 2.007\ 134\ 9543... \tag{73}$$

4.8. We can use the same approach to also numerically solve G, h, e, m_e, k_B by first rewriting their geometrical formulas in terms of (c^*, μ_0^*, R^*) and then replacing with the CODATA values for (c, μ_0, R, α). Here I solve for Planck's constant.

$$h^* = 2^3\pi^4\Omega^4\frac{r^{13}}{v^5},\ u^{19} \tag{74}$$

$$(h^*)^3 = (2^3\pi^4\Omega^4\frac{r^{13}}{v^5})^3,\ u^{19*3} = \frac{2\pi^{10}(\mu_0^*)^3}{3^6(c^*)^5\alpha^{13}(R^*)^2},\ unit = u^{57} \tag{75}$$

Likewise with the other physical constants.

$$(e^*)^3 = \frac{4\pi^5}{3^3(c^*)^4\alpha^8(R^*)},\ unit = u^{-81} \tag{76}$$

$$(k_B^*)^3 = \frac{\pi^5(\mu_0^*)^3}{3^3 2(c^*)^4\alpha^5(R^*)},\ unit = u^{87} \tag{77}$$

$$(G^*)^5 = \frac{\pi^3(\mu_0^*)}{2^{20}3^6\alpha^{11}(R^*)^2},\ unit = u^{30} \tag{78}$$

$$(m_e^*)^3 = \frac{16\pi^{10}(R^*)(\mu_0^*)^3}{3^6(c^*)^8\alpha^7},\ unit = u^{45} \tag{79}$$

$$(r_d)^3 = \frac{3^3 4\pi^5(\mu_0^*)^3\alpha^{19}(R^*)^2}{5^3(c^*)^{10}},\ unit = u^{24} \tag{80}$$

As such, we may numerically solve the least precise physical constants in terms of the 4 most precise (c, μ_0, R, α). Results are consistent with CODATA 2014 (table p1).

5 u as $\sqrt{L/M.T}$

By setting u as $\sqrt{L/M.T}$, in SI terms $u = \sqrt{m/kg.s}$, we can construct a table of units (3.).

$$u,\ units = \sqrt{\frac{L}{MT}} = \sqrt{\frac{m}{kg.s}} = u^{-13-15+30=2/1} = u \tag{81}$$

$$x,\ units = \sqrt{\frac{M^9T^{11}}{L^{15}}} = \sqrt{\frac{kg^9s^{11}}{m^{15}}} = u^0 = 1 \tag{82}$$

$$y,\ units = M^2T = kg^2s = u^0 = 1 \tag{83}$$

This gives us units;

$$u^3 = \frac{L^{3/2}}{M^{3/2}T^{3/2}} = A,\ (ampere)$$

$$u^6(y) = L^3/T^2M,\ (G...m^3/s^2kg)$$

$$u^{13}(xy) = 1/L,\ (l_p^{-1}...1/m)$$

$$u^{15}(xy^2) = M,\ (m_P...kg)$$

$$u^{17}(xy^2) = L/T = V,\ (c...m/s)$$

$$u^{20}(xy^2) = \frac{L^{5/2}}{M^{3/2}T^{5/2}} = AV,\ (T_P)$$

$$u^{30}(x^2y^3) = 1/T,\ (t_p^{-1}...1/s)$$

$$u^{56}(x^4y^7) = \frac{M^4T}{L^2} = \frac{ML}{T^2A^2},\ (\mu_0...kgm/s^2A^2)$$

To derive the formulas for MLTVA (4.2.) we repeat the above. We first assign a β (unit = u), i (from x) and j (from y).

$$R = \sqrt{P} = \sqrt{\Omega}r,\ units = u^8 \tag{84}$$

$$\beta = \frac{V}{R^2} = \frac{2\pi R^2}{M} = \frac{A^{1/3}\alpha^{1/3}}{2} ...,\ unit = u \tag{85}$$

$$i = \frac{1}{2\pi(2\pi\Omega)^{15}},\ unit = 1$$

$$j = \frac{r^{17}}{v^8} = k^2t = \frac{k^8}{r^{15}}...,\ unit = \frac{u^{17*8}}{u^{8*17}} = u^{15*2}u^{-30}... = 1$$

From β, i, j we can reproduce the (r, v) formulas in 4.2.

$$A = \beta^3(\frac{2^3}{\alpha}) = \frac{2^6\pi^3\Omega^3}{\alpha}\frac{v^3}{r^6},\ u^3 \tag{86}$$

$$G = \frac{\beta^6}{2^3\pi^2}(j) = 2^3\pi^4\Omega^6\frac{r^5}{v^2},\ u^6 \tag{87}$$

$$L^{-1} = 4\pi\beta^{13}(ij) = \frac{1}{2\pi^2\Omega^2}\frac{v^5}{r^9},\ u^{13} \tag{88}$$

$$M = 2\pi\beta^{15}(ij^2) = \frac{r^4}{v},\ u^{15} \tag{89}$$

$$P = \beta^{16}(ij^2) = \Omega r^2,\ u^{16} \tag{90}$$

$$V = \beta^{17}(ij^2) = 2\pi\Omega^2 v,\ u^{17} \tag{91}$$

$$T_P^* = \frac{2^3\beta^{20}}{\pi\alpha}(ij^2) = \frac{2^7\pi^3\Omega^5}{\alpha}\frac{v^4}{r^6},\ u^{20} \tag{92}$$

$$T^{-1} = 2\pi\beta^{30}(i^2j^3) = \frac{1}{2\pi}\frac{v^6}{r^9},\ u^{30} \tag{93}$$

$$\mu_0^* = \frac{\pi^3\alpha\beta^{56}}{2^3}(i^4j^7) = \frac{\alpha}{2^{11}\pi^5\Omega^4}r^7,\ u^{56} \tag{94}$$

$$\epsilon_0^{*-1} = \frac{\pi^3\alpha\beta^{90}}{2^3}(i^6j^{11}) = \frac{\alpha}{2^9\pi^3}v^2r^7,\ u^{90} \tag{95}$$

In summary I have described a programmable approach using geometrical objects based on a formula for a virtual electron from which we may derive (dimensioned) physical constants and their associated units via

- 2 (fixed) mathematical constants (α, Ω),
- 2 (variable) unit-dependent scalars to which numerical values are assigned and
- the unit u as our rule-set.

In the "Trialogue on the number of fundamental physical constants" was debated the number, from 0 to 3, of dimensionful units required [5]. Here the answer is both 0 and 1; 0 in that the electron, being a virtual particle, has no units, yet it can unfold to form the Planck units and these can be de-constructed in terms of the unit u, and so in terms of the physical universe, being a dimensioned universe (a universe of measurable units) the answer is 1.

6 Notes on the physical constants

In the article "Surprises in numerical expressions of physical constants", Amir et al write ... In science, as in life, 'surprises' can be adequately appreciated only in the presence of a null model, what we expect a priori. In physics, theories sometimes express the values of dimensionless physical constants as combinations of mathematical constants like pi or e. The inverse problem also arises, whereby the measured value of a physical constant admits a 'surprisingly' simple approximation in terms of well-known mathematical constants. Can we estimate the probability for this to be a mere coincidence? [24]

In 1963, Dirac noted regarding the fundamental constants; "The physics of the future, of course, cannot have the three quantities $\hbar, e, c$ all as fundamental quantities. Only two of them can be fundamental, and the third must be derived from those two." [25]

J. Barrow and J. Webb on the physical constants; 'Some things never change. Physicists call them the *constants of nature*. Such quantities as the velocity of light, c, Newton's constant of gravitation, G, and the mass of the electron, m_e, are assumed to be the same at all places and times in the universe. They form the scaffolding around which theories of physics are erected, and they define the fabric of our universe. Physics has progressed by making ever more accurate measurements of their values. And yet, remarkably, no one has ever successfully predicted or explained any of the constants. Physicists have no idea why they take the special numerical values that they do. In SI units, c is 299,792,458; G is 6.673e-11; and m_e is 9.10938188e-31 -numbers that follow no discernible pattern. The only thread running through the values is that if many of them were even slightly different, complex atomic structures such as living beings would not be possible. The desire to explain the constants has been one of the driving forces behind efforts to develop a complete unified description of nature, or "theory of everything". Physicists have hoped that such a theory would show that each of the constants of nature could have only one logically possible value. It would reveal an underlying order to the seeming arbitrariness of nature.' [6].

At present, there is no candidate theory of everything that is able to calculate the mass of the electron [23].

"The fundamental constants divide into two categories, units independent and units dependent, because only the constants in the former category have values that are not determined by the human convention of units and so are true fundamental constants in the sense that they are inherent properties of our universe. In comparison, constants in the latter category are not fundamental constants in the sense that their particular values are determined by the human convention of units" -*L. and J. Hsu* [4].

A charged rotating black hole is a black hole that possesses angular momentum and charge. In particular, it rotates about one of its axes of symmetry. In physics, there is a speculative notion that if there were a black hole with the same mass and charge as an electron, it would share many of the properties of the electron including the magnetic moment and Compton wavelength. This idea is substantiated within a series of papers published by Albert Einstein between 1927 and 1949. In them, he showed that if elementary particles were treated as singularities in spacetime, it was unnecessary to postulate geodesic motion as part of general relativity [26].

The Dirac Kerr–Newman black-hole electron was introduced by Burinskii using geometrical arguments. The Dirac wave function plays the role of an order parameter that signals a broken symmetry and the electron acquires an extended space-time structure. Although speculative, this idea was corroborated by a detailed analysis and calculation [8].

References

1. Linnebo, Øystein, "Platonism in the Philosophy of Mathematics", The Stanford Encyclopedia of Philosophy (Summer 2017 Edition), Edward N. Zalta (ed.), plato.stanford.edu/archives/sum2017/entries/platonism-mathematics
2. Nick Bostrom, Philosophical Quarterly 53 (211):243–255 (2003)
3. https://en.wikipedia.org/wiki/Philosophy-of-mathematics (22, Oct 2017)
4. Leonardo Hsu, Jong-Ping Hsu; The physical basis of natural units; Eur. Phys. J. Plus (2012) 127:11
5. Michael J. Duff et al JHEP03(2002)023 Trialogue on the number of fundamental constants
6. J. Barrow, J. Webb, Inconstant Constants, Scientific American 292, 56 - 63 (2005)
7. M. Planck, Uber irreversible Strahlungsforgange. Ann. d. Phys. (4), (1900) 1, S. 69-122.
8. A. Burinskii, Gravitation and Cosmology, 2008, Vol. 14, No. 2, pp. 109–122; Pleiades Publishing, 2008.
   DOI: 10.1134/S0202289308020011
9. Feynman, Richard P. (1977). The Feynman Lectures on Physics, vol. I. Addison-Wesley. p. 22-10. ISBN 0-201-02010-6.
10. Tegmark, Max (February 2008). "The Mathematical Universe". Foundations of Physics. 38 (2): 101–150.
11. planckmomentum.com/calc/ (online calculator)
12. Magnetic monopole
    en.wikipedia.org/wiki/Magnetic-monopole (10/2015)
13. Fine structure constant
    en.wikipedia.org/wiki/Fine-structure-constant (06/2015)
14. Burinskii, A. (2005). "The Dirac–Kerr electron". arXiv:hep-th/0507109
15. Rydberg constant
    http://physics.nist.gov/cgi-bin/cuu/Value?ryd
16. Planck constant
    http://physics.nist.gov/cgi-bin/cuu/Value?ha
17. Electron mass
    http://physics.nist.gov/cgi-bin/cuu/Value?me
18. Fine structure constant
    http://physics.nist.gov/cgi-bin/cuu/Value?alphinv
19. Elementary charge
    http://physics.nist.gov/cgi-bin/cuu/Value?e
20. Vacuum of permeability
    http://physics.nist.gov/cgi-bin/cuu/Value?mu0
21. Gravitation constant
    http://physics.nist.gov/cgi-bin/cuu/Value?bg

22. Boltzmann constant
http://physics.nist.gov/cgi-bin/cuu/Value?k
23. https://en.wikipedia.org/wiki/Theory-of-everything (02/2016)
24. Ariel Amir, Mikhail Lemeshko, Tadashi Tokieda; 26/02/2016
Surprises in numerical expressions of physical constants
arXiv:1603.00299 [physics.pop-ph]
25. Dirac, Paul, The Evolution of the Physicist's Picture of Nature, June 25, 2010
https://blogs.scientificamerican.com/guest-blog/the-evolution-of-the-physicists-picture-of-nature/
26. Macleod, Malcolm, A virtual black-hole electron and the sqrt of Planck momentum,
http://vixra.org/pdf/1102.0032v9.pdf
27. Macleod, Malcolm; 2017 edition (online), God the Programmer, the philosophy behind a Virtual Universe,
http://platoscode.com/