Entanglement Drive

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Part 1
Generalized Form of a New Non-Gravitational Acceleration Equation

Acceleration of the Density Field
(Like a Warp Bubble)

\[ a_c \equiv a_{\phi_c} = 6 \left( \phi^3 \sqrt{\frac{R_{\phi_a}}{l_p}} \right)^{1/2} \]

Object’s Acceleration

Phase Factor

Estimated Radius of the Accelerated Density Field

Unit Vector

Local Acceleration of Gravitation

Planck Length

Like a time change ratio between the Warp Bubble and the reaction mass in the Warp Bubble with respect to its effect on the Universe

\[ \phi \]

\[ c \equiv \text{object under study} \]

\[ \phi \equiv \text{Density Field} \]

\[ \phi_a \equiv \text{Accelerated Density Field} \]

\[ M \equiv \text{Local Gravitation Source} \]
All things have a thin-shell of thickness $\Delta R_c$.
Chameleon Cosmology: Generalized Thin-Shell Thickness

Energy Scale Factor

\[ \Delta R_c \approx \frac{1}{3} \left( \frac{M^2}{\rho_c R_c} \right) \left( \frac{2M_{PL}^4}{\rho_0} \right)^{1/3} = \frac{\kappa_0}{\rho_c R_c} \]

The Mass’s Density (Space Drive Density)

The Local Environmental Density (i.e., Atmosphere)

The Mass’s Radius (Space Drive Radius)

\[ M_{PL} = \frac{m_p}{\sqrt{8\pi}} \]

Reduced Planck Mass

\[ \kappa_0 = \frac{1}{3} M^2 \left( \frac{2M_{PL}^4}{\rho_0} \right)^{1/3} \]
Modified Chameleon Model

It then follows that $\varphi \sim \varphi_{atm}$ in the atmosphere.

For an inverse power-law potential, $V(\phi) = M^{4+n} \phi^{-n}$, Eq. (10) can be translated into a constraint on the scale $M$ which, for $n$ and $\beta$ of order unity, is given by [4]:

$$M \lesssim 10^{-3} \text{ eV} \approx (1 \text{ mm})^{-1}.$$  \hspace{1cm} (11)

Remarkably, this coincides with the energy scale associated with the dark energy causing cosmic acceleration [5].

In my analysis, it was found that $n = 2$ and $\beta$ not necessarily the order unity

$$M \equiv M_E \approx \left( \frac{\Lambda}{8\pi l_p^2} \right)^{1/4} \approx 11378 \text{ } m^{-1} \approx (0.1 \text{ mm})^{-1}$$

which is a Cosmological Energy Scale Factor.

$\Lambda$ - Cosmological Constant
By applying Susskind’s interpretation of entanglement to the thin-shell mechanism in Chameleon Cosmology, one can allow the thin-shell(s) to be the observer between an object’s density and its surrounding environment density. Whereby, changes to these densities invoke changes to the thin-shell thickness in order to conserve both entanglement and energy between the two densities.


-- The fabric of Space-time is composed of thin-shells --
Chameleon Cosmology: Gravity Force Equation

Given that:
1. The fabric of Space-time is composed of thin-shells
2. The Chameleon acceleration is a subtraction from gravity

Then under Warp Drive Terminology:
• The energy in the thin-shell is exotic energy that carries a negative acceleration vector with respect to gravity.
The density field of an object is defined by the density within the outer perimeter of its thin-shell.

Whereby, the acceleration of an object is due to the change in an object’s density field or thin-shell thickness, in the direction of motion, in order to conserve momentum between the object and the thin-shell, while still conserving the entanglement and energy between the object’s density and its environment’s density.
Accelerated Density Field and Radius

For non-random internal reaction-mass accelerations

Case 1: Ballistic Object (Type I)
Object with reaction mass $m_k = m_c$ having acceleration $a_k = a_c$ with no Mass ejected

\[
\rho_{\phi_a} = \rho_c + \left( \frac{a_c}{g_M} \right) \rho_c = \frac{3}{4\pi} \frac{m_c}{R_{\phi_a}^3} \Rightarrow R_{\phi_a}^3 = \left(1 + \frac{a_c}{g_M} \right)^{-1} R_c^3
\]

Case 2: Entanglement Drive (Type I)
Object with reaction mass $m_k < m_c$ having acceleration $a_k > a_c$ with no Mass ejected

\[
\rho_{\phi_a} = \rho_c + \left( \frac{a_k}{g_M} \right) \rho_k = \frac{3}{4\pi} \frac{m_c}{R_{\phi_a}^3} \Rightarrow R_{\phi_a}^3 = \left(1 + \frac{a_k}{g_M} \left( \frac{m_k}{m_c} \right) \right)^{-1} R_c^3
\]

Case 3: Rocket Type Object (Type II)
Nozzle with reaction mass $m_k = m_{ex}$ having acceleration $a_{ex} > a_c$ being ejected

\[
\rho_{\phi_{\text{nozzle}}} = -\left( \frac{a_{ex}}{g_M} \right) \rho_{ex} \approx -\frac{3}{4\pi} \frac{m_{ex}}{R_{\phi_{\text{nozzle}}}^3} \Rightarrow R_{\phi_{\text{nozzle}}} \approx \sqrt{2} R_{\text{nozzle exit}}
\]
Given that:
1. The fabric of Space-time is composed of thin-shells
2. The energy in the thin-shell is exotic energy

Then:
An accelerated density field is a

“Warp Bubble.”
ACCELERATION MECHANISM
Accelerated Thin-Shell Model

Gravitational Coupling Factor

$\Delta R_c \approx \beta_G^2 \sqrt{l_p R_c}$

Estimate of the Accelerated Density Field Radius

$\Delta R_{\phi_a} \approx \beta_G^2 \sqrt{l_p R_{\phi_a}}$

Chameleon Cosmology Thin-Shell

Accelerated Thin-Shell
ACCELERATION MECHANISM
Accelerated Thin-Shell Model

\[
\Delta R_{\phi_a} \approx \beta_G^2 \sqrt{\frac{l_p}{R_{\phi_a}}} R_{\phi_a} \approx \varphi \left( \frac{\beta_G^2}{\beta_{\phi_a}^2} \right)^{1/3} R_{\phi_a}
\]
Phase Factor

\[ \phi \equiv \frac{\text{time rate of change of the Warp Bubble}}{\text{time rate of change of the accelerated } m_k} \]

\[ \alpha_U \approx \left( \frac{dt_\phi}{dt_k} \right) \alpha_U \]

\[ \alpha_U \equiv \frac{\text{Universe normalization of } dt_k}{\text{Universe normalization of } dt_\phi} = \frac{dt_{kU}}{dt_{\phi U}} \]

\[ dt_\phi \approx dt_{\phi U} \quad \text{Implies a Mach Effect System} \]
Phase Factor

Case 1: Ballistic Object

\[ dt_{\phi_U} = dt_{\phi}; \quad dt_{k_U} = \left( \frac{1}{\eta_k M_E R_c} \right) dt_k; \quad \phi \approx \frac{1}{\eta_k M_E R_c} \]

Case 2: Entanglement Drive (Type I)

\[ dt_{\phi_U} = (\eta_\phi M_E d_k) dt_{\phi}; \quad dt_{k_U} = \left( \frac{1}{\eta_k M_E R_c} \right) dt_k; \quad \phi \approx \left( \frac{1}{\eta_\phi M_E d_k} \right) \left( \frac{1}{\eta_k M_E R_c} \right) \]

Case 3: Rocket Type Object (Type II)

\[ dt_{\phi_U} = dt_{k_U}; \quad \phi \approx \frac{dt_{\phi}}{dt_k}; \quad \phi \approx \frac{R_{\phi_{nozzle}}}{v_{ex}} \frac{\dot{m}}{m_{ex}} \]

\[ R_{\phi_{nozzle}} \approx \sqrt{2} R_{nozzle \ exit} \]
Geometric Factors

Geometric factors result from the Universe scale normalization

\[ \eta_k \] - accelerated mass geometric factor
\[ \eta_\phi \] - field density geometric factor

Where generally, so far:

Case 1: \[ \eta_k \approx X \pi \]

Case 2: \[ \eta_k \eta_\phi \approx Y \pi \]
Generalized Non-Gravitational Acceleration

\[ a_{\phi_c} = 6 \beta_{\phi_a} \left( \frac{\Delta R_{\phi_a}}{R_{\phi_a}} \right) g_M \, \hat{\phi} \approx 6 \left( \varphi^3 \sqrt{\frac{R_{\phi_a}}{l_p}} \right)^{1/2} g_M \, \hat{\phi} \]

Accelerated Density Field Form of Chameleon Acceleration

\[ a_c = 6 \beta_c \left( \frac{\Delta R_c}{R_c} \right) g_g \, \hat{\phi} \]
Generalized Non-Gravitational Acceleration

Case 1: Ballistic Object

\[ a_{\phi_c} \approx 6 \left( \varphi^3 \sqrt{\frac{R_{\phi_a}}{l_p}} \right)^{1/2} g_M \hat{\phi} \approx \frac{F_{\text{applied}}}{m_c} = a_c \]

\[ \varphi \approx \frac{1}{\eta_k M_E R_c} \]
\[ \eta_k \approx 8\pi \]

\[ R_{\phi_a} = \frac{R_c}{\left(1 + \frac{a_c}{g_M} \right)^{1/3}} \]
Generalized Non-Gravitational Acceleration

Case 3: Internal mass acceleration with ejected Mass (i.e., Rocket)

\[ a_\phi \approx 6 \left( \varphi_r^3 \right) \left[ \sqrt{\frac{l_p}{R_{\phi_T}}} \left( \frac{1}{\sqrt{R_{\phi_T}}} - \frac{1}{\sqrt{R_{\phi_{nozzle}}}} \right) \right]^{1/2} \]

\[ g_M \hat{\phi} \approx \frac{T_{BO}}{m_{BO}} = a_{rocket} \]

\[ \varphi_r \approx \eta \left( \frac{R_{\phi_{nozzle}}}{v_{ex}} \right) \left( \frac{\dot{m}_{ex}}{m_{ex}} \right) \]

\[ R_{\phi_T} \approx \text{Throat Radius} \]

\[ R_{\phi_{nozzle}} \approx \sqrt{2} \times \text{Exit Radius} \]