Theory of Objective Motions of Wave Source and Receiver in Medium Body

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1. Wave Sources and Receivers

Objects transmitting wave signals are wave sources, such as the sound sources of trains and the light sources of celestial bodies. People or objects receiving wave signals are receivers, such as the men listening to the sounds of trains and telescopes in outer space recording light signals from stars and galaxies. When we observe, we receive light signals from the light source. All celestial bodies are wave sources and we are receivers of their wave signals.

2. Medium Bodies and Perfect Vacuum

Except in perfect vacuum—which only exists in theory, not in reality—light propagates through medium consisting of particles. When, due to some external limitation, some particles are contained in a certain space, they form a material medium body. The external limitation can be a closed shell. For example, the shell of a train contains all the air in the train and forms the train's air medium body. The external limitation can also be a shapeless force. For example, the gravity of the earth limits the air around the earth and forms the earth's air medium body.

If a container is in a state of perfect vacuum, it makes a (perfect) vacuum medium body. There is no particle in a (perfect) vacuum medium body and it is a nonmaterial medium body.

Both material medium body and nonmaterial vacuum medium body are medium bodies.

3. Internal Independence and External Dependence of Medium Bodies

A small medium body may move in a large medium body. The large medium body is called the small medium body's mother medium body, and the small medium body is called the large medium body's daughter medium body. For example, the earth's air medium body is the train's air medium body's mother medium body, and the train's air medium body is the earth's air medium body's daughter medium body.

When receivers in a daughter medium body observe and measure wave sources in the daughter medium body, it is unnecessary to consider, and it is impossible to measure, the velocity of the daughter medium body in the mother medium body. This attribute of medium bodies is called the internal independence of medium bodies. Because of this attribute of internal independence, it is impossible to measure the velocity of a train in the earth's air medium body with sound, light or electromagnetic experiments in the train. It is also impossible to measure the velocity of the earth in the solar system with light or electromagnetic experiments on the surface of the earth. That is why the Michelson-Morley experiment failed to detect the speed of earth moving around the sun.

When receivers in a daughter medium body observe and measure wave sources in the mother medium body, or when receivers in a mother medium body observe and measure wave sources in a daughter medium body, it is necessary to consider, and it is possible to measure, the velocity of the daughter medium body in the mother medium body. This attribute of medium bodies is called the external dependence of medium bodies. When we, the observers of the universe, receive light or electromagnetic signals from celestial bodies, and observe planets in the solar system, stars in the Milky Way and galaxies outside the Milky Way, we must consider our motions as receivers in the solar system, in the Milky Way and in the universe, as the solar system, the Milky Way, and the universe are all material medium bodies.

4. Objective Durations and Subjective Durations of Wave Signals

Wave signals without durations, such as the light signal in Einstein's first paper on the theory of relativity, "On the Electrodynamics of Moving Bodies," are unanalyzable and without value of analysis and measurement in physics. Period, frequency, and wavelength are all concepts based on the concept of duration. We use two observers' different judges of the same signal in a model of two trains to analyze quantitatively the Doppler effect of wave in a medium body and take the earth's air medium body as an example.

Let us assume a train S moves forward with speed V_S in the earth's air medium body and there is an observer Sally in S. In front of S, another train R, moves forward with speed V_R and there is an observer Robert in R. The speed of the wave in the earth's air medium body is V. At the moment of t_{S0}, the front of a wave signal leaves S, and at this moment, the distance between R and S is d_{SR0}. The front of the wave signal arrives at R at the moment of t_{R0}. When the front of the wave signal propagates forward, R is moving forward too, so $V(t_{R0} - t_{S0}) = d_{SR0} + V_R(t_{R0} - t_{S0})$ and $t_{R0} = d_{SR0}/(V - V_R) + t_{S0}$. The end of the wave signal leaves S at the moment of $t_{S1} = t_{S0} + \tau_S$, and the distance between R and S at this moment is $d_{SR1} = d_{SR0} + V_R\tau_S - V_S\tau_S$. The end of the wave signal arrives at R at the moment of t_{R1}, so $V(t_{R1} - t_{S1}) = d_{SR1} + V_R(t_{R1} - t_{S1})$ and $t_{R1} = d_{SR1}/(V - V_R) + t_{S1}$. In Sally's measurement, the signal

starts at t_{S0} and ends at t_{S1}, so Sally judges that the signal has duration of $\tau_S = t_{S1} - t_{S0}$. In Robert's measurement, the signal starts at t_{R0} and ends at t_{R1}, so Robert judges that the signal has duration of $\tau_{RseeS} = t_{R1} - t_{R0} = \tau_S(V - V_S)/(V - V_R)$.

The duration of a wave signal measured by the observer moving with the wave source is defined as the objective duration of the wave signal. The duration of a wave signal measured by the observer not moving with the wave source is defined as the subjective duration of the wave signal.

5. Objective Characteristics and Subjective Characteristics of Wave Signals

Now assume the objective duration of the wave signal, τ_S, equals one objective period of the wave signal, T_S, so we have $\tau_S = T_S = 1/f_S$ and $\lambda_S = V/f_S$, with f_S and λ_S as the objective frequency and the objective wavelength of the wave signal.

The wave signal with one period cannot change to a wave signal with several periods, so in the measurement of receiver R, the wave signal still has one period, the subjective period, $T_{RseeS} = T_S(V - V_S)/(V - V_R)$.

The ratio of the subjective period and the objective period is defined as y, so $y = (V - V_S)/(V - V_R)$.

So, because of the motions of the wave source and the receiver, the subjective characteristics of the wave signal are: $\tau_{RseeS} = \tau_S y$, $T_{RseeS} = T_S y$, $f_{RseeS} = f_S/y$, and $\lambda_{RseeS} = \lambda_S y$.

Analysis above is suitable for sound signal when V is the speed of sound in the air. Analysis above is suitable for light signal and electromagnetic wave too when V is the speed of light in the air.

6. Theory of Objective Motions of Wave Source and Receiver in Medium Body

It is traditionally regarded that there must be a reference body (frame) to measure a body's velocity. But, in a medium body, the velocity of wave propagated from the wave source to the receiver, $\boldsymbol{V}$, can and should be the standard of measurement for the velocities of the wave source and the receiver. So, in the measurement of the motions of wave sources and the receivers, the reference body is not needed (Figure 1). For convenience, in material medium body, the material medium can be regarded as the reference body.

The velocities of the wave source and the receiver in a medium body, $\boldsymbol{V}_S$ and $\boldsymbol{V}_R$, measured using the velocity of wave propagated from the wave source to the receiver $\boldsymbol{V}$ as the standard of measurement, are defined as their objective velocities in the medium body (Figure 2).

When the directions of $\boldsymbol{V}_S$ and $\boldsymbol{V}_R$ are in the same line with the direction of $\boldsymbol{V}$, $y = (\boldsymbol{V} - \boldsymbol{V}_S)/(\boldsymbol{V} - \boldsymbol{V}_R)$. When the directions of $\boldsymbol{V}_S$ and $\boldsymbol{V}_R$ are not in the same line with the direction of $\boldsymbol{V}$, $y = (V - V_S\cos\alpha_S)/(V - V_R\cos\alpha_R)$, where α_S is the angle between the vector $\boldsymbol{V}_S$ and $\boldsymbol{V}$, α_R is the angle between the vector $\boldsymbol{V}_R$ and $\boldsymbol{V}$, and V, V_S and V_R are $\boldsymbol{V}$, $\boldsymbol{V}_S$ and $\boldsymbol{V}_R$'s magnitudes (speeds).

The theory considering the objective motions of the wave source and the receiver in medium body is called the theory of objective motions.

7. Shell Method of Velocity Measurement

A daughter medium body with a shell can measure its own velocity in its mother medium body without any reference body. Take a train as an example and assume the train moves forward with speed V_T. Set a wave source S and a receiver R on the top of the train outside the shell, with the wave source behind the receiver with distance d_{SR0}. The front of a wave signal leaves S at the moment of t_{S0} with speed V and arrives at R at the moment of t_{R0}, so $V(t_{R0} - t_{S0}) = d_{SR0} + V_R(t_{R0} - t_{S0})$ and $V_T = V_R = V - d_{SR0}/(t_{R0} - t_{S0})$. In this way, the velocity of the daughter medium body in its mother medium body can be measured or verified.

8. Precise Radar Velocity Measurement

The airborne radar S transmits an electromagnetic signal with frequency f_S to the target plane R. The target plane R reflects the signal. When the airborne radar S receives the reflected signal, the received frequency is $f_{SseeR} = f_S[(V - V_R\cos\alpha_R)(V + V_S\cos\alpha_S)]/[(V - V_S\cos\alpha_S)(V + V_R\cos\alpha_R)]$. Let $r = f_{SseeR}/f_S$, then the speed of the target plane can be calculated by $V_R = [(1 - r)V^2 + (1 + r)VV_S\cos\alpha_S]/\{[(1 + r)V + (1 - r)V_S\cos\alpha_S]\cos\alpha_R\}$.

If the radar is ground-based, then $f_{SseeR} = f_S(V - V_R\cos\alpha_R)/(V + V_R\cos\alpha_R)$, so the speed of the target plane can be calculated by $V_R = (1 - r)V/[(1 + r)\cos\alpha_R]$.

9. Celestial Medium Bodies

Celestial medium bodies are formed because of the gravity of

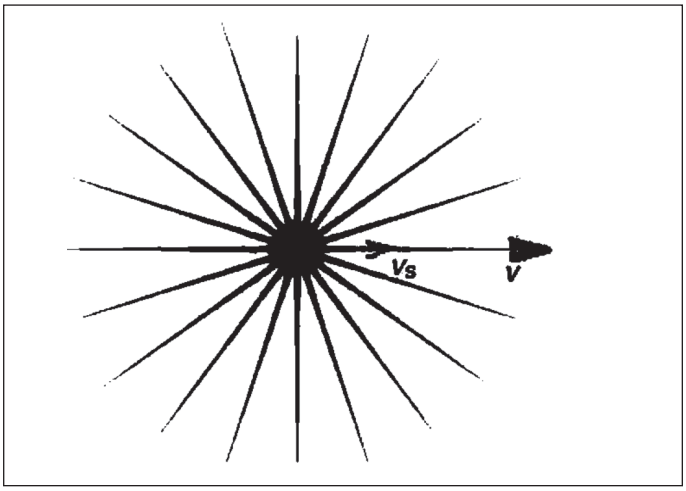

Figure 1. A light source moving objectively.

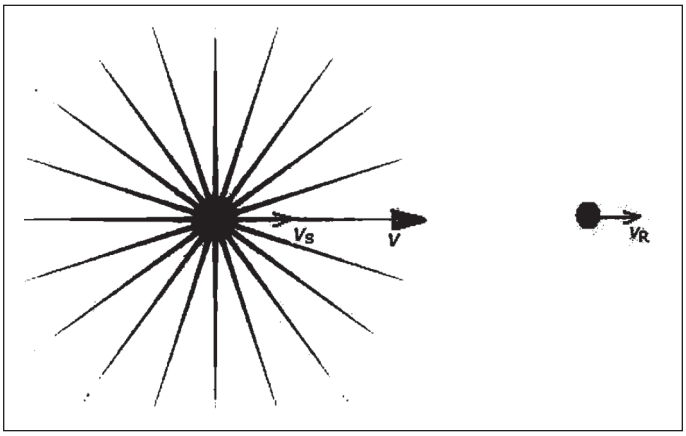

Figure 2. A light source and a receiver moving objectively.

the celestial bodies. The earth medium body includes the earth's air medium body, but it includes more. All the particles moving around the earth are in the earth medium body, regardless of their density, so the earth medium body goes as far as the moon, as the moon moves around the earth too. It does not look like a ball, but looks like a comet, as the medium is pushed by the solar wind.

The solar medium body is formed because of the gravity of the sun and it includes all the particles moving around the sun in the solar system. It starts from the surface of the sun and goes beyond Oort Cloud. All planets move around the sun near a plate, as are the particles, so the solar medium body does not look like a ball, but looks like an ellipsoid. The solar medium body is the mother medium body of the earth medium body.

The Milky Way medium body is formed because of the gravity of the Milky Way and it includes all the particles moving around the Milky Way. Like the solar medium body, it looks like an ellipsoid, but is much larger. The Milky Way medium body is the (1-level) mother medium body of the solar medium body, and the 2-level mother medium body of the earth medium body,

The universe medium body is the largest medium body. But is it the mother medium body of the Milky Way medium body, and the 2-level mother medium body of the solar medium body, and the 3-level mother medium body of the earth medium body? Up to now, we are not sure.

10. Reasons for the Redshift

The earth moves in the solar medium body with velocity $\boldsymbol{V}_{\text{Earth}}$, and a wave source moves in the solar medium body with velocity $\boldsymbol{V}_{\text{S}}$, so in the observation, we have $y_1 = (V_1 - V_{\text{S}}\cos\alpha_{\text{S}})/(V_1 - V_{\text{Earth}}\cos\alpha_{\text{Earth}})$, where V_1 is the speed of the wave in the solar medium body.

The solar system moves in the Milky Way medium body with velocity $\boldsymbol{V}_{\text{SolarSystem}}$, and a wave source moves in the Milky Way medium body with velocity $\boldsymbol{V}_{\text{S}}$, so in the observation, $y_2 = (V_2 - V_{\text{S}}\cos\alpha_{\text{S}})/(V_2 - V_{\text{SolarSystem}}\cos\alpha_{\text{SolarSystem}})$, where V_2 is the speed of the wave in the Milky Way medium body.

At the moment, let us assume the universe medium body is the mother medium body of the Milky Way medium body, and the Milky Way medium body moves in universe medium body with velocity $\boldsymbol{V}_{\text{MilkyWay}}$, and a wave source moves in the universe medium body with velocity $\boldsymbol{V}_{\text{S}}$, so in the observation, $y_3 = (V_3 - V_{\text{S}}\cos\alpha_{\text{S}})/(V_3 - V_{\text{MilkyWay}}\cos\alpha_{\text{MilkyWay}})$, where V_3 is the speed of the wave in the universe medium body.

Redshift is defined as $z = f_{\text{S}}/f_{\text{RseeS}} - 1$, so $z = y - 1$. So the redshift of the planets is from y_1, the redshift of the stars is mostly from y_2, and the redshift of the galaxies and quasars is mostly from y_3. The reasons for the high redshift of some quasars are the velocity of the Milky Way medium body in the universe medium body and the velocities of the quasars in the universe medium body, not the relative speed of the quasars leaving us.

11. Edge Convex Lens Characteristics of Celestial Medium Bodies

The density of the medium of a celestial medium body is not consistent. The nearer to the central celestial body, the medium becomes denser. The farther from the central celestial body, the medium becomes thinner. When a celestial medium body exists between the wave source and the receiver, the wave has to travel past the medium in this celestial medium body and refracts. It looks like an edge convex lens existing between the wave source and the receiver. All phenomenon explained by gravitational lens can be explained with edge convex lens characteristics of celestial medium bodies. When light from stars goes near the sun, it refracts because of the dense medium existing around the sun, not because of the gravity of the sun.

12. Space and Time

Another name for medium body is medium space, or space. There is no perfect vacuum space in the universe. Mediums or medium consisting of particles always exist between the wave source and the receiver. The theory of relativity, based on the concept of perfect vacuum, is wrong and meaningless in physics.

Time is absolute and objective. Distance and motion cannot change time. The problem of simultaneity is caused by distance, not by motion as it is explained in the theory of relativity. The problem of duration is caused by motion.

Space and time are independent from each other, and they are not relevant. The word spacetime is meaningless in science.

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About the Author

Tiger Zhang was born in 1974. He studied signal analysis at university from 1992 to 1996 and then worked as a signal analyst. In 2005, he became an independent researcher. In 2008, while reading Albert Einstein's papers and books, Zhang found out that light signals and light in the theory of relativity are without any duration and then are unanalyzable. Thinking deeper and deeper, he wrote and published three papers in the *Chinese Journal of Spectroscopy Laboratory* in 2009: "Resisting Force and Pushing Force of Medium in Motions of Celestial Bodies and Particles Moving at a Speed Greater than the Speed of Light," "Objectivity of Time, Synchronization of Clocks, and Mistakes of the Theory of Relativity" and "Theory of Objective Motions of Wave Source and Receiver in Medium Body." A detailed version of this paper (in Chinese) was published in the *Chinese Journal of Spectroscopy Laboratory*, 3, 26, 2009.

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