Neutron Reinterpretation: A Unified Model for Strong, Weak, and Electromagnetic Interactions

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Abstract

This paper proposes a reconceptualization of the neutron as an intermediate state between proton and antiproton transformations, introducing antimatter into nucleon dynamics and challenging traditional Quantum Chromodynamics (QCD). It reconsiders the nature of quarks and offers a unified framework for strong, weak, and electromagnetic interactions. The model reveals a hidden flaw in the electroweak theory, reinterpreting the role of W and Z bosons in beta decay, and provides an explanation for the neutron's non-zero Electric Dipole Moment (EDM). Additionally, it offers insights into the relationship between matter and antimatter and hints at the connection between these field dynamics and dark matter, contributing to a deeper understanding of fundamental forces and particle transformations.

1 Introduction

Quantum Chromodynamics (QCD) has been instrumental in describing the strong interaction between quarks and gluons, which bind nucleons such as protons and neutrons. However, it remains limited in unifying the strong force with the weak and electromagnetic interactions. Furthermore, QCD does not fully address the role of antimatter within the structure of nucleons, nor does it offer a seamless integration of all fundamental forces within a unified framework.

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This paper presents a reinterpretation of QCD, where quark interactions follow a dynamic cyclical process, transitioning between symmetric and antisymmetric states. This model also redefines the neutron as a transient state between proton and antiproton, proposing that strong, weak, and electromagnetic interactions are different manifestations of the same underlying cycle.

2 Field Landscape for Quarks

In this model, quarks are not elementary particles but represent the forces of pressure that emerge naturally from the expansion and contraction of two intersecting fields, which may vary in or out of phase. The nuclear subfields formed by these intersecting fields can either exhibit mirror symmetry, forming a bosonic system not ruled by the Pauli Exclusion Principle, or mirror antisymmetry, forming a fermionic system governed by the Pauli Exclusion Principle.

These nuclear subfields serve as the scenario where the strong, weak, and electromagnetic interactions manifest, creating strong or weak bonds within the system. Additionally, they are the framework for mass and energy transfer and topological transformations within the nucleus.

When these fields expand or contract: - The expanding fields, which push outward with their outer positive curvature, generate forces of pressure interpreted as quarks. - The contracting fields, which pull inward with their inner negative curvature, also create forces of pressure, representing quarks that operate in the opposite direction.

This interplay between the expanding and contracting nuclear subfields governs the behavior of quarks and their interactions in strong, weak, and electromagnetic forces. As these subfields expand or contract, quarks act as carriers of the resulting forces.

3 Antimatter and Quark Dynamics

Historically, Werner Heisenberg initially proposed that the neutron might be the antiparticle of the proton. However, this idea was dismissed due to the significant differences in their measured masses. Quantum Chromodynamics (QCD) subsequently introduced a more detailed framework for nucleons, describing neutrons as composed of two down quarks and one up quark, while protons consist of two up quarks and one down quark. Although this quark model has been effective in explaining many nuclear phenomena, it lacks a coherent integration of antimatter within nucleons, leading to theoretical challenges and inconsistencies, particularly concerning the role of antiprotons and the stability of the model. This gap in QCD's treatment of antimatter suggests the need for a new perspective on nucleon dynamics.

In our proposed framework, the neutron is conceptually interpreted as an intermediate state between proton and antiproton during transformations such as beta decay. In this process:

- The right transverse contracting proton decays into a right transverse expanding neutrino, while simultaneously, a left transverse contracting antineutrino transforms into a left transverse contracting antiproton. - The adjacent longitudinal electromagnetic field is cobordant with both the left- and right-handed transverse subfields, mediating the transfer of energy and mass between them. - Furthermore, an inverted electromagnetic field exists on the convex side of the system, considered dark from the concave point of view, contributing to a unified structure that governs the transformation of quarks during these processes.

During beta decay (β^+ or β^-), the model predicts that a compressed proton physically decays into a decompressed neutrino. In the case of β^+ decay, the positive curvature of the expanding neutrino exerts a force of pressure on the right side of the longitudinal electric field, which is moving leftward. This motion is driven by the attractive force of the left contracting intersecting field and the repulsive force of the right expanding intersecting field. As the electric field continues to travel toward the central axis of symmetry, dividing the system into positive and negative regions, it retains its positive charge.

It should be noted that the terms "attractive" and "repulsive" have been used metaphorically in this context. Rather than implying classical forces of attraction or repulsion, they describe the natural inward displacement of the left contracting field, whose right curvature forms the right side of the electron field, and the outward displacement of the right expanding field, whose left curvature forms the left side of the electric field.

The electric field exhibits a double negative curvature, shaped by these intersecting fields, and symmetrically divided by a singularity point — a cusp at the region of intersection between the two intersecting fields, where there is an abrupt change in the curvature direction. In this framework, we view the electric charge not as an intrinsic property of matter but as a manifestation of the geometry dynamics of the intersecting fields.

Upon reaching the point of charge neutrality, where the system's positive and negative regions are symmetrically divided by the central axis, the double negative curvature of the longitudinal electric field is split into two equal sectors. However, while the right sector experiences compression from the positive curvature of the expanding neutrino, the left sector undergoes decompression. This decompression is caused by the displacement of the right expanding intersecting field.

At this critical moment, the left and right transverse subfields, which are undergoing topological transformation, become momentarily coincident in their curvature, acquiring mirror-symmetric shapes. This results in a brief state where the entire nucleus can be considered neutral in charge.

Nevertheless, several asymmetries are concealed within this seemingly balanced state. The asymmetry in charge distribution within the electric field (and also within the dark electromagnetic field) generates a positive Electric Dipole Moment (EDM) in the longitudinal electric field. This EDM can be interpreted as a gap mass, as the field is located at the zero point where the overall charge would be expected to be neutral.

Additionally, although the left and right transverse subfields are momentarily coincident, one is contracting while the other is expanding. This discrepancy leads to a different quark configuration, as the down quark is considered lighter than the up quark.

4 Reinterpreting Quarks in Strong and Weak Interactions

This quark configuration differs from the conventional QCD model, where the up quark is arbitrarily considered lighter than the down quark. It is important to note that quark masses have not been directly measured due to their confinement within hadrons. Instead, their values are inferred from theoretical models and the interpretation of experimental observations.

However, in our model, the properties of quarks emerge naturally from the geometric dynamics of the intersecting fields. In this model, the down quark is naturally lighter than the up quark because the down quark represents the pressure force exerted by the outer side of an expanding field. Expanding fields cause less pressure than contracting fields, which explains the relative weight difference between the quarks:

The up quark, related to the contracting field, represents a higher force of compression and thus appears heavier. The down quark, associated with the expanding field, exerts less pressure and appears lighter.

Up and down quarks converge in the strong interaction, where a contracting transverse subfield experiences a double force of compression—one from the inner side of the contracting field and the other from the outer side of the expanding field. This results in an asymmetry in the mass distribution within these subfields and influences the speed of the waves generated by their inward displacement.

The increased inner orbital motions of the contracting subfield represent increased kinetic energy, which constitutes the stronger bond characteristic of the strong interaction.

In contrast, up and down quarks diverge in the weak interaction, where an expanding transverse subfield experiences a double decompression. The orbital motions become inertial and progressively slow down, representing a weaker bond within the system. Additionally, there is a mass asymmetry between the two regions inside the expanding subfield, related to the differing effects of the contracting and expanding fields, represented by the diverging up and down quark pair.

4.1 Why the Standard Model Misinterprets W and Z Bosons

In the Standard Model, W and Z bosons are believed to mediate proton-neutron transformations through the weak interaction. This is understandable, given that the quark configurations and the positions of the transverse subfields in both the symmetric and antisymmetric systems appear similar on the surface. Without clearly differentiating between these systems, it becomes easy to misinterpret these transformations as being driven solely by W and Z bosons.

In our model, the distinction between the symmetric and antisymmetric systems plays a critical role. While the transverse subfields occupy the same location in both systems, they undergo different transformations, exhibit distinct charges, energy distributions, and polarizations, and are either governed by or excluded from the Pauli Exclusion Principle, depending on whether the system is antisymmetric or symmetric.

In the symmetric system, the transverse subfields are mirror symmetric and function as bosonic fields, corresponding to the W and Z bosons in the Standard Model. These fields mediate the strong interaction experienced by the longitudinal subfield, which emits photonic radiation through double compression. In this symmetric system, the strong interaction is effectively mediated by the W and Z bosons, representing the transverse subfields.

However, in the antisymmetric system, there is a fundamental shift. The transverse subfields are not merely mediators but become the protagonists of the topological transformations themselves. One quark flips direction (for example, an up quark flips to a down quark), creating a reconfiguration of the transverse subfields. Now, the left transverse subfield undergoes double decompression and mimics the shape of a W boson but without the associated charge, as it no longer experiences pressure. Meanwhile, the right transverse subfield contracts, behaving as a proton in this antisymmetric fermionic system.

In this case, it is the longitudinal subfield that acts as the mediator between the transverse subfields. This is a key difference: while the symmetric system has the transverse subfields mediating the longitudinal subfields interactions, the antisymmetric system has the longitudinal subfield mediating between the transverse subfields as they undergo proton-neutrino and antiproton-antineutrino transformations.

4.2 Clarifying the Misinterpretation of W and Z Bosons in Field Dynamics

In our model, the transverse subfields undergo distinct transformations depending on whether the system is symmetric or antisymmetric.

At first glance, the shape of the right transverse subfield seems similar in both the symmetric system (where both intersecting fields are contracting) and in the antisymmetric system (where the right transverse subfield is contracting while the left transverse subfield is expanding). However, despite this similarity in shape, their underlying behavior is fundamentally different.

In the symmetric system, both transverse subfields contract or expand simultaneously, resulting in a mirror-symmetric bosonic configuration. In contrast, in the antisymmetric system, the right transverse subfield contracts while the left transverse subfield expands or vice versa, creating a mirror-antisymmetric fermionic configuration.

This difference arises due to a delay in the expansion or contraction of one field relative to the other, and the quark configuration shifts as a result—specifically involving the down quark and the dark down quark—when, for example, the left field expands while the right field continues to contract.

Physicists working within the Standard Model may have misinterpreted these phenomena. The similar appearance of the transverse subfields in both systems, along with the flipping of a single quark, may lead to the conclusion that W bosons mediate proton-neutron transformations.

However, our model distinguishes between bosonic mirror-symmetric transverse subfields and fermionic mirror-antisymmetric ones, while accounting for the involvement of antimatter within nucleons.

Ultimately, this distinction can be viewed as a matter of conceptual framing. In a rotational context, as the system transitions from the symmetric to the antisymmetric state, the mirror-symmetric bosonic transverse subfields are transformed into mirror-antisymmetric fermionic subfields.

The appearance of antisymmetry between matter and mirror antimatter is what gives rise to the fermionic nature of these subfields. This shift goes beyond just flipping a quark from up to down; it reflects a deeper transformation where the roles of mediators and protagonists of the interactions change. In the mirror-symmetric (bosonic) state, the transverse electromagnetic subfields act as mediators of the transformations that occur in the longitudinal subfields, where the strong and weak interactions take place. In contrast, when mirror antisymmetry arises, the roles reverse: the longitudinal electromagnetic subfields mediate the strong and weak interactions driven by the topological transformations occurring in the transverse subfields. This change can be conceptually understood as a 90-degree shift in the system's dynamics.

4.3 Proton-Neutrino Decay in Our Model

Our model goes beyond this interpretation by explaining that the transformation between proton and neutron is only one part of the picture. In the antisymmetric system, the transverse subfields undergo topological transformations themselves, and the mediation between them is provided by the eletromagnetic longitudinal subfield. This longitudinal subfield mediates the mass-energy transfer between the transverse subfields as they undergo proton-neutrino transformations in β^+ decay and antiproton-antineutrino transformations in β^- decay, respectively.

In the Standard Model, the focus is primarily on the weak interaction causing proton-neutron transformations during beta decay, but it does not account for proton decay into a neutrino. This is because the Standard Model treats protons as stable particles and does not recognize the broader topological dynamics of the intersecting fields, which allow for proton-neutrino decay.

In our model, the W boson is not causing the quark flip; instead, it is the result of the natural field dynamics between the symmetric and antisymmetric systems.

Antisymmetry arises when half of the system experiences a delay, introducing a purely imaginary time dimension, distinct from the imaginary time dimension governing spacetime transformations in the symmetric system.

On the other hand, while the Standard Model uses three quarks to describe particle transformations, our model considers four quarks. These quarks affect the subfields in pairs, and the transformation from proton to neutrino and from antineutrino to antiproton, passing through the intermediate state of the neutron, cannot be explained solely by three quarks.

The fourth, missing quark, which we refer to as the dark quark, is located on the convex side of the system and contributes to the second half of the double decompression that occurs in the neutrino or antineutrino. This dark quark plays an essential role in ensuring that the double curvature of the fields accurately accounts for the mass-energy transfers during these transformations.

4.4 Photon and Antiphoton Dynamics

In the bosonic symmetric system, when both intersecting fields expand and the longitudinal subfield decays after emitting pulsating photonic radiation, the quarks invert their direction. This inversion reflects how the forces of pressure now operate in the opposite direction:

The longitudinal subfield loses energy while expanding downward. Meanwhile, a dark antiphoton is exerted on the convex side of the system, where the strong dark interaction now manifests.

When both intersecting fields contract, the longitudinal field experiences double compression, increasing its energy and generating a pushing force as it moves upwards along the axis, emitting radiation along the Y-axis.

This cyclical inversion of forces, accompanied by photon and antiphoton radiation, reveals the deeper symmetry and structure underlying the interplay between the strong, weak, and electromagnetic interactions within the system.

5 The Neutron's Neutrality and Field Compression

The neutron's neutral charge arises from the symmetry of the longitudinal electric field, which is divided by the central axis of symmetry. This axis separates the system into a right-handed positive region and a left-handed negative region. As the electric field is split into two seemingly equal positive and negative sectors, it can be thought of as carrying equal amounts of positive and negative charge, maintaining the neutral balance characteristic of the neutron's intermediate state during Beta transformations.

Additionally, the transverse subfields become mirror symmetric at this moment, and their $+1/2$ and $-1/2$ spins balance each other out, contributing to a momentary neutral state.

However, despite this apparent neutral balance, there is a hidden charge imbalance. The longitudinal electric field is actually divided into two unequal regions:

A compressed region, which carries the positive charge in β^+ decay. A decompressed region, which does not carry charge but instead manifests as a force of compression in the adjacent transverse subfield.

This asymmetry in charge density creates a charge gap, which manifests as a non-zero Electric Dipole Moment (+EDM). However, this charge gap is restored in the time-reversed reaction of β^- decay, when the system's asymmetry flips.

In this reverse reaction, the previously decompressed region in the longitudinal subfield becomes compressed, and its previously compressed region decompresses, while the subfield travels rightward toward the central axis to become a positron, still carrying a $-EDM$ that restores the previous charge imbalance.

Additionally, this model explains the existence of a permanent EDM in the electron and positron subfields, resulting from the charge distribution asymmetry between their half-compressed and half-decompressed regions. These asymmetries in charge distribution further contribute to the overall dynamics of the proton-neutrino and antiproton-antineutrino transformations.

On the other hand, with respect to the heavier weight of the neutron compared to the proton, it is not solely a result of its quark configuration. In this model, quarks are symbolic representations of the forces of pressure acting within the system. We believe that the difference in weight during the neutron's intermediate state arises from the varying mass density and inner kinetic energy in the contracting proton and the mirror-symmetric transverse subfields that are undergoing expansion and contraction.

This asymmetry might also be influenced by the slight mass of the antineutrino, which is gradually being transformed, and/or by the electron subfield, which is considered part of the neutron during this intermediate phase. The electron subfield, being half-compressed and half-decompressed, contributes to the neutron's neutral state and may account for part of the weight difference compared to the proton.

Finally, a mass-density and inner kinetic energy asymmetry emerges in the transverse subfields of the antisymmetric system due to the differing pressures exerted by the expanding and contracting fields. The expanding field exerts a lighter pressure, while the contracting field exerts a stronger pressure. This difference in pressure levels leads to varying wave speeds within the inward waves of the subfields, caused by the double compression in the strong interaction.

The distinct compression levels inside the subfields contribute to these varying velocities, which further explain the observed discrepancies in energy and mass distribution between quarks and subfields.

A similar cause may be attributed to the differences detected in background radiation at the cosmological level.

6 Beta Decay Predictions in the Intersecting Fields Model

Our intersecting fields model predicts a distinct difference in the pathways of Beta+ (β^+) and Beta- (β^-) decays, offering a new perspective on these processes compared to the standard model. According to traditional Quantum Chromodynamics (QCD) and electroweak theory, Beta+ decay involves the emission of a positron, while Beta- decay involves the emission of an electron. However, our model provides a different interpretation.

In the standard model: Beta+ decay involves a proton converting into a neutron, emitting a positron and a neutrino. Beta- decay involves a neutron converting into a proton, emitting an electron and an antineutrino.

In contrast, our model proposes the following path for Beta+ decay:

While the proton is decaying into a neutrino via its gradual expansion, it passes through an intermediate state, which is mirror symmetric to the antineutrino that is simultaneously transforming into an antiproton at the opposite side of the system. This intermediate state, where the electric field transits through the central axis of symmetry, is considered to be the neutron.

During this process, the adjacent electron field contributes to the transformation. The positron field moves through the central axis of symmetry. As it crosses this axis, it moves from the positive side of the system to the negative side, where it becomes an electron.

Similarly, for Beta- decay:

An antiproton decays gradually into an expanding antineutrino, passing through an intermediate state where it becomes mirror symmetric with the neutrino that is contracting on the opposite side being transformed into a proton. This intermediate moment of symmetry is considered to be the antineutron.

The electron subfield moves right, passing through the central axis of symmetry. As it crosses this axis, it enters the positive side of the system and becomes a positron.

In Beta+ decay, the path can be described as: Proton $\rightarrow$ Neutron $\rightarrow$ Antiproton, emitting an electron and a neutrino.

And in Beta- decay as: Antiproton → Antineutron → Proton, emitting a positron and an antineutrino.

In our model, the neutron is not just a static particle but represents a key intermediate state during transformations, embodying the mirror-symmetric configuration between proton-neutrino and antineutrino-antiproton transitions.

We hypothesize that Beta+ and Beta- decays are continuous, gradual processes governed by the expansion and contraction dynamics of the intersecting fields.

Furthermore, with respect to the divergences between our model and QCD regarding the emitted beta particles in Beta+ and Beta- decay, we propose that the traditional theory may be influenced by classical notions of attractive and repulsive charges—where proton and positron, or antiproton and electron, are assumed to repel each other. In contrast, in our model, these particles do not interact through attractive or repulsive forces, but rather follow the periodic transformations of the intersecting fields.

In our model: The partial decompression of the positron creates, through the outer side of its right sector curvature, a force of 1/2 compression on the proton. The remaining 1/2 compression is caused by the partial decompression of the dark positron. Similarly, in Beta- decay, the electron's partial decompression allows for its interaction with the antiproton.

Thus, we propose that this framework provides a more nuanced interpretation of Beta decay, in which the dynamics at play are not simply reducible to classical repulsion but arise from the pressure dynamics inherent in the intersecting fields.

7 Conclusion

This model provides a unified framework that integrates strong, weak, and electromagnetic interactions via the dynamic behavior of quarks, which are reinterpreted as forces of pressure arising from the expansion and contraction of intersecting fields.

By introducing a novel reconceptualization of the neutron as an intermediate state between proton and antiproton, the model integrates antimatter into nucleon transformations, offering clues for resolving the longstanding asymmetry between matter and antimatter.

It also redefines beta decays as transitions between proton and neutrino, and antiproton and antineutrino, predicting the actual decay of protons into neutrinos and antiprotons into antineutrinos.

The dynamics of the system can also be expressed in terms of transfer of mass-energy between matter and antimatter regions, mediated by the electromagnetic interaction, with the electromagnetic subfields characterized by half-compression and half-decompression forces.

The model naturally explains how Electric Dipole Moments (EDMs) emerge from the dual curvature within the subfields and from the 1/2 compression and 1/2 decompression characteristic of the electromagnetic subfields.

Strong interactions arise from the double compression force present in the contracting subfields, while weak interactions are linked to the double decompression force in the expanding subfields, and are cause by the own dynamics and phases of inetersecting fields.

This contrasts with the arbitrary quark mass assignments in the Standard Model, offering a more coherent explanation of mass-density differences and energy distribution between quarks, grounded in the varying pressures of the expanding and contracting fields.

Moreover, this model clarifies the misunderstanding surrounding W and Z bosons in the Standard Model. The perceived role of these bosonic fields in mediating proton-neutron transformations stems from the misinterpretation of the fermionic system's dynamics. This confusion arises because the bosonic subfields occupy the same spatial location and have similar quark configurations as in the symmetric system, leading to the assumption that they play a mediating role in the fermionic transformations.

In reality, the intrinsic forces driving these transformations are governed by the underlying expansion and contraction of the intersecting fields.

By resolving these issues, reinterpreting the neutron's role, and providing a unified perspective on antimatter and dark matter, this model presents a compelling framework for rethinking particle physics and unifying the strong, weak, and electromagnetic interactions.

8 Mathematical Implications and Future Research

Although this model is primarily conceptual and lacks a specific algebraic formulation, it suggests several conceptual clues for further mathematical research.

One key area is the potential relationship between the cusp singularities in the curvature of the intersecting fields and Gorenstein liason.

The four singularities that arise in the four stages of the system (both fields contracting, the right field contracting while the left expands, both fields expanding, and the left field contracting while the right expands) drive a total of 16 singularities in the system. This suggests a possible link between the geometry of the intersecting fields and Kummer-type surfaces in algebraic geometry.

Additionally, the alternation and interpolation between the symmetric and antisymmetric systems, driven by the rotation of the system, may connect the transformations of the subfields to the mathematical structures of Hodge cycles. The rotational behavior hints at deeper symmetries that could relate these field dynamics to the cycles governing cohomological structures in complex algebraic varieties.

Furthermore, the two intersecting fields can be considered in the framework of two gravitational fields, as in bigravity or bimetric gravitational models. However, they could also be modeled as two interacting Higgs fields, where the Higgs boson represents the force of pressure caused by the fluctuations in these fields.

Alternatively, these fields could be interpreted as two interacting pion fields that harbor a shared nucleus of united solitons, pointing towards a solitonic structure governing nucleon transformations and interactions.

keywords: Quantum Chromodynamics (QCD), Neutron reinterpretation, Cyclic quark model, Antimatter in nucleons, Beta decay, W and Z bosons, Electric Dipole Moment (EDM), non zero nEDM, Strong and weak interactions, Proton-antiproton transformations, Proton-neutrino decay, Antiproton-antineutrino decay, Antineutron, Bigravity, Bimetric gravity, Electroweak theory, Quark dynamics, Field compression and decompression, Dark matter, Unified field theory, Matter-antimatter Symmetry, Mass-energy Transfer, Matter-antimatter transfer, Curvature singularities.

9 Related diagrams

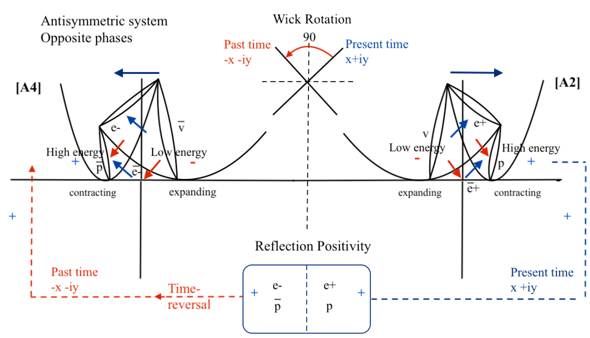

Figure 1: *Reflection positivity in the antisymmetric system*

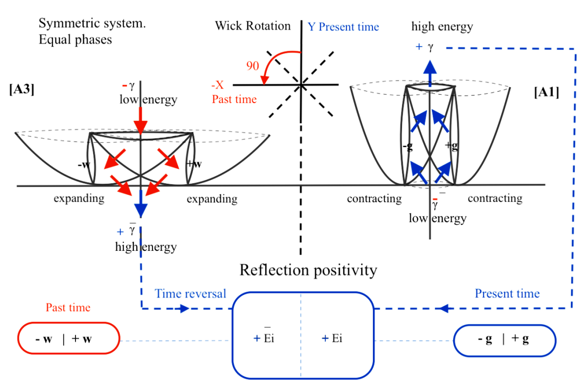

Figure 2: *Reflection positivity in the Symmetric system*

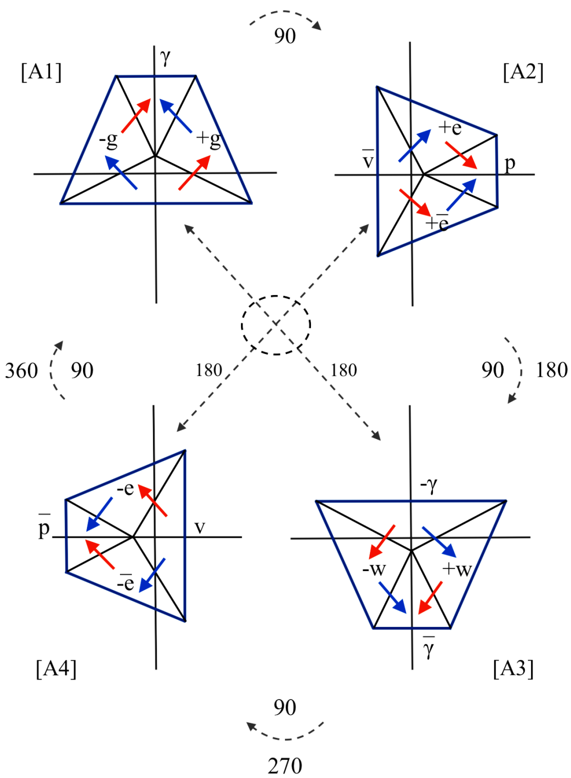

Figure 3: *Interpolating states in the rotational system*