Robot World: Child Robots – Consolidated Annotated Bibliography on Embodied Robot Fleets, Child-Scale Companion Robots and LLM-plus Architectures

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Executive Summary (by Copilot)

This document consolidates a comprehensive annotated bibliography focused on child-scale companion robots, embodied robot fleets, and architectures integrating large language models (LLM-plus). It identifies gaps in existing literature and organizes sources into scholarly works, articles and reports, science fiction, and patents.

Embodiment and learning gaps: The literature is strong on embodiment, social robotics in education, connected toys, privacy, and robot-fleet orchestration but limited on child-scale robots deliberately generating filtered developmental learning signals for improving central LLM-plus models.

Governance and privacy concerns: There is substantial literature warning about privacy, safety, emotional dependency, and surveillance risks in child-facing robots, but less on governance models that restrict central systems to receive only summarised updates rather than intimate child narratives, making the distinction between fleet learning and indiscriminate data sharing a novel design principle.

Social norms and roles: Existing work discusses social robots in education and AI companions but lacks clear differentiation between child-size robots as bounded companions versus quasi-teachers or parental substitutes. The proposed design insists on limited physical strength, visible kill-switches, adult override, and constrained social roles.

Multi-ecology learning: Literature usually treats adult domestic robots, self-driving vehicles, and child companion robots separately, while the proposal suggests they may jointly form an embodied-data economy for LLM-plus systems, an extrapolation beyond current evidence.

Fiction and patents as scenario and engineering sources: Fictional works and patents show many building blocks exist in imagination or primitive engineering—such as companionship, expressive faces, sensing, Wi-Fi connectivity, and profile updating—but lack a mature, integrated framework combining child-appropriate embodiment, strict privacy boundaries, and fleet-level learning benefits.

Scholarly literature highlights: Key academic sources support embodiment as structuring intelligence through interaction, cross-modal language grounding via embodied interaction, robots facilitating inclusive social processes among children, rights-based governance for child-facing AI, and technical mechanisms like federated and continual learning for privacy-preserving model improvement.

Articles and reports on privacy and social norms: Policy documents and trade reports emphasize protecting children's data and safety, caution about emotional dependency on AI companions, parental concerns about AI toys as friends, the need for privacy protections, and the emerging scale and economic potential of humanoid robots.

Science fiction insights: Foundational and recent fiction provide conceptual insights into robot safety, bounded obedience, companionship, emotional substitution risks, and governance asymmetries, helping to imagine the tensions between local intimacy and central intelligence in child-robot systems.

Patents on robotic companions: Patents reveal existing engineering of child-like or toy-like robots with cameras, microphones, expressive faces, social and affective behaviors, data reporting, and profile updating, highlighting the technical feasibility of many components relevant to child-scale companion robots.

Overview

This document consolidates the bibliography developed so far for the Robot World child-robot strand. It is organised in four groups: scholarly literature; articles, blogs, trade reports and related sources; science-fiction novels and stories; and patents. A short gap analysis appears first. URLs are shown in full within the bibliographic entries, as requested.

Gap analysis

The existing literature is much stronger on embodiment, social robotics in education, connected toys, privacy risk, and general robot-fleet orchestration than on the precise architecture proposed in the overview paper. In particular, there is only limited direct literature on child-scale robots as deliberate generators of filtered developmental learning signals for central LLM-plus model improvement.

A second gap concerns the governance architecture for child-facing robots. There is substantial literature warning about privacy, safety, emotional dependency and smart-toy surveillance, but much less that clearly specifies a model in which central systems receive only summarised or parameterised updates rather than intimate narrative detail from children's daily lives. The proposed distinction between fleet learning and indiscriminate 'telling tales' to headquarters therefore appears relatively novel as a design principle.

A third gap concerns social norms. There is literature on social robots in education and on AI companions, but less that cleanly distinguishes between child-size robots as bounded companions and child-size robots as quasi-teachers, quasi-parents or substitutes for human relationships. The paper's insistence on very limited physical strength, visible kill-switches, adult override, and carefully constrained social role therefore goes beyond much of the literature found so far.

A fourth gap concerns multi-ecology learning. The evidence found here suggests that adult domestic robots, self-driving vehicles and child-size companion robots are usually discussed in separate literatures. The proposed claim that they may jointly form a broader embodied-data economy for LLM-plus systems appears to be more of an extrapolation than well established by *existing* literature.

Finally, the fiction and patent material indicate that many of the building blocks already exist in imagination or primitive engineering form – companionship, expressive faces, sensing, Wi-Fi links, activity reporting, and profile updating – but the literature does not yet seem to provide a mature, integrated framework combining child-suitable embodiment, strict privacy boundaries, and fleet-level learning benefit.

Group 1. Scholarly literature

Entries in Group 1 begin with author name and date, followed by the full Leeds Harvard-style reference. Each entry includes a short annotation, a quotation or locator, and an access-status note.

Asada, M., Hosoda, K., Kuniyoshi, Y., Ishiguro, H., Inui, T., Yoshikawa, Y., Ogino, M. and Yoshida, C. (2009) 'Cognitive developmental robotics: A survey', IEEE Transactions on Autonomous Mental Development, 1(1), pp. 12–34. doi: 10.1109/TAMD.2009.2021702. Available at: https://www.cs.tufts.edu/comp/150DR/readings/week1/Asada09g.pdf (Accessed: 16 March 2026).

Annotation: A strong academic anchor for the claim that embodiment is not merely a hardware feature but a route to structuring intelligence through interaction. This supports the proposed argument that robot fleets can generate grounded learning data unavailable in text-only corpora.

Locator / quotation: p. 12: "physical embodiment" enabling "information structuring through interactions with the environment, including other agents".

Access status: Full text used.

Heinrich, S., Yao, Y., Hinz, T., Liu, Z., Hummel, T., Kerzel, M., Weber, C. and Wermter, S. (2020) 'Crossmodal language grounding in an embodied neurocognitive model', Frontiers in Neurorobotics, 14, article 52. doi: 10.3389/fnbot.2020.00052. Available at: https://www.frontiersin.org/journals/neurorobotics/articles/10.3389/fnbot.2020.00052/full (Accessed: 16 March 2026).

Annotation: Especially useful for the proposed claim that language can be grounded through multimodal embodied interaction rather than through text alone. It supports the idea that embodied robots could improve central model architectures by feeding back structured sensorimotor learning.

Locator / quotation: Conclusion section: "crossmodally integrated representations are sufficient for acquiring language merely from sensory input through interaction with objects in an environment".

Access status: Full text used.

Tuncer, S., Gillet, S. and Leite, I. (2022) 'Robot-mediated inclusive processes in groups of children: From gaze aversion to mutual smiling gaze', Frontiers in Robotics and AI, 9, article 729146. doi: 10.3389/frobt.2022.729146. Available at: https://www.frontiersin.org/journals/robotics-and-ai/articles/10.3389/frobt.2022.729146/full (Accessed: 16 March 2026).

Annotation: Useful for the specifically child-world strand. It does not establish the whole Robot World architecture, but it shows that robots can shape socially meaningful interaction among children.

Locator / quotation: Abstract / p. 1 equivalent: "social robots can help inclusive processes in groups of children".

Access status: Full text used.

Fosch-Villaronga, E. and Poulsen, A. (2023) 'Toy story or children story? Putting children and their rights at the forefront of the artificial intelligence revolution', AI and Society, 38, pp. 1341–1352. Available at: https://link.springer.com/article/10.1007/s00146-021-01295-w (Accessed: 16 March 2026).

Annotation: A particularly relevant academic bridge between smart-toy debates and the rights-based governance issues surrounding child-facing robots. It is useful for the proposed insistence that child robots should be treated as a special category rather than merely as ordinary consumer devices.

Locator / quotation: Section on connected toys: smart connected toys are equipped with "sensors, data processing capacities, and connectivity" and penetrate "pervasively personal environments".

Access status: Substantial text visible on publisher page; not all pages inspected in PDF form.

Dai, S., Low, B.K.H. and Jaillet, P. (2022) 'A survey of online federated and transfer learning', Artificial Intelligence Review, 56, pp. 1001–1042. Available at: https://arxiv.org/pdf/2202.03070 (Accessed: 16 March 2026).

Annotation: This is one of the clearest technical sources for the missing link between local robot learning and central model improvement. It is not child-robot-specific, but it provides a plausible mechanism for the proposed architecture in which only updates, not raw intimate data, flow back upstream.

Locator / quotation: Abstract: federated learning preserves privacy "by sharing local model update parameters instead of raw instances from local clients".

Access status: Preprint used.

Le, L., Hussing, M. and Eaton, E. (2024) 'Distributed continual learning', arXiv preprint, arXiv:2405.17466. Available at: https://arxiv.org/pdf/2405.17466 (Accessed: 16 March 2026).

Annotation: Relevant where robots in different homes or settings continue to learn over time from different tasks and environments. It strengthens the technical plausibility of heterogeneous child-robot fleets contributing filtered experience to shared models.

Locator / quotation: Abstract: studies "the intersection of continual and federated learning, in which independent agents face unique tasks in their environments".

Access status: Preprint used.

Group 2. Articles, blogs, trade reports and related sources

Entries in Group 2 begin with bracketed identifiers. This group is particularly strong on privacy, safety, social norms and market-scale discussions, but weaker than Group 1 on formal theory.

[1] United Nations Children's Fund (UNICEF) (2025) Guidance on AI and Children 3.0. Florence: UNICEF Innocenti. Available at: https://www.unicef.org/innocenti/media/11991/file/UNICEF-Innocenti-Guidance-on-AI-and-Children-3-2025.pdf (Accessed: 16 March 2026).

Annotation: One of the strongest policy anchors for the child-robot strand. It provides a rights-and-safeguards frame even though it is not written specifically for child-size robots.

Locator / quotation: p. 12: "Protect children's data and privacy" and "Ensure safety for children".

Access status: Full PDF used.

[2] Brookings Institution (2025) ‘Policy guardrails needed as babies around the world begin to interact with AI’. Washington, DC: Brookings Institution. Available at: https://www.brookings.edu/articles/policy-guardrails-needed-as-babies-around-the-world-begin-to-interact-with-ai/ (Accessed: 16 March 2026).

Annotation: Useful for the normative caution that child-facing AI may arrive before settled social limits or regulation.

Locator / quotation: Main text: major firms are moving towards “age-appropriate” AI children’s toys; “We simply do not know how children’s brains will be shaped”.

Access status: Full article used.

[3] Common Sense Media (2025) Talk, Trust, and Trade-Offs: How and Why Teens Use AI Companions. San Francisco, CA: Common Sense Media. Available at: https://www.commonsensemedia.org/research/talk-trust-and-trade-offs-how-and-why-teens-use-ai-companions (Accessed: 16 March 2026).

Annotation: Important evidence that relational AI is already normalising among younger users and that personal disclosure to companion systems is common.

Locator / quotation: Headline finding: “nearly three in four teens have used AI companions” and “a quarter have shared personal information with these platforms”.

Access status: Full web report used.

[4] Common Sense Media (2025) CSM AI Risk Assessment: Social AI Companions. San Francisco, CA: Common Sense Media. Available at: https://www.commonsensemedia.org/sites/default/files/pug/csm-ai-risk-assessment-social-ai-companions_final.pdf (Accessed: 16 March 2026).

Annotation: A sharp warning source for under-18 use of social AI companions. Particularly relevant to the proposed boundary between bounded robotic assistance and quasi-relational substitution.

Locator / quotation: p. 3: “unacceptably risky for teens” and “not recommend use of social AI companions for those under age 18”.

Access status: Full PDF used.

[5] Common Sense Media (2026) AI in the Toy Box: How Parents View AI-Enabled Toys for Young Children. San Francisco, CA: Common Sense Media. Available at: https://www.commonsensemedia.org/research/ai-in-the-toy-box-how-parents-view-ai-enabled-toys-for-young-children (Accessed: 16 March 2026).

Annotation: Useful because it addresses AI toys rather than only chat companions. It speaks directly to the social-norm question around companion roles.

Locator / quotation: Summary findings: “the majority of parents don't want AI toys to act as friends for their kids” and “no one under 18 should use AI companions”.

Access status: Full report page used.

[6] Brookings Institution (2025) ‘What happens when AI chatbots replace real human connection?’ Washington, DC: Brookings Institution. Available at:

https://www.brookings.edu/articles/what-happens-when-ai-chatbots-replace-real-human-connection/ (Accessed: 16 March 2026).

Annotation: Not robotics-specific, but useful on emotional substitution and dependency risks.

Locator / quotation: Main text refers to the risk of "emotional dependency".

Access status: Full article used.

[7] Brookings Institution (2025) 'Should you have an AI companion?' Washington, DC: Brookings Institution. Available at: https://www.brookings.edu/articles/should-you-have-an-ai-companion/ (Accessed: 16 March 2026).

Annotation: Important for the privacy dimension of AI companionship.

Locator / quotation: Section 'Privacy and security risks': "24% said they share personal information with AI companions" and "we need much stronger privacy and cyber protections".

Access status: Full article used.

[8] Brookings Institution (2023) 'Should schools ban or integrate generative AI in the classroom?' Washington, DC: Brookings Institution. Available at: https://www.brookings.edu/articles/should-schools-ban-or-integrate-generative-ai-in-the-classroom/ (Accessed: 16 March 2026).

Annotation: Useful educational-policy context for any child robot placed near tutoring or reassurance roles.

Locator / quotation: Main text: schools have acted "without any definitive guidelines".

Access status: Full article used.

[9] Perry, A.M. and Turner Lee, N. (2019) 'AI is coming to schools, and if we're not careful, so will its biases'. Washington, DC: Brookings Institution. Available at: https://www.brookings.edu/articles/ai-is-coming-to-schools-and-if-were-not-careful-so-will-its-biases/ (Accessed: 16 March 2026).

Annotation: Useful caution against using AI to displace skilled adult educational labour.

Locator / quotation: Main text: "AI won't work if it's intended as a way to avoid the hard work of recruiting skilled teachers."

Access status: Full article used.

[10] McKinsey & Company (2025) 'Will embodied AI create robotic coworkers?' New York, NY: McKinsey & Company. Available at: https://www.mckinsey.com/industries/industrials/our-insights/will-embodied-ai-create-robotic-coworkers (Accessed: 16 March 2026).

Annotation: Useful for the wider embodied-AI framing beyond the child-robot strand.

Locator / quotation: Main text: robots may be "trained to pack, pick, lift, inspect, move, and collaborate with people in real time".

Access status: Full article used.

[11] McKinsey Global Institute (2025) Agents, Robots, and Us: Skill Partnerships in the Age of AI. New York, NY: McKinsey Global Institute. Available at:

https://www.mckinsey.com/mgi/our-research/agents-robots-and-us-skill-partnerships-in-the-age-of-ai (Accessed: 16 March 2026).

Annotation: Useful for the broader economic and architectural context of Robot World.

Locator / quotation: Main text: “Work in the future will be a partnership between people, agents, and robots” and about “$2.9 trillion of economic value” in the United States by 2030.

Access status: Full report page used.

[12] Morgan Stanley Investment Management (2026) Embodied AI and the Rise of Humanoid Robots. New York, NY: Morgan Stanley Investment Management. Available at: https://www.morganstanley.com/im/publication/insights/articles/article_humanoid-robots_a4.pdf (Accessed: 16 March 2026).

Annotation: A useful investor/trade perspective on why human-like forms appeal in everyday environments, even if the proposed child robots may need to be less humanoid.

Locator / quotation: Report text refers to operation in “everyday environments” and says such forms often feel “more approachable”.

Access status: Full PDF used.

[13] Morgan Stanley Research (2025) ‘Humanoid robot market expected to reach $5 trillion by 2050’. New York, NY: Morgan Stanley. Available at: https://www.morganstanley.com/insights/articles/humanoid-robot-market-5-trillion-by-2050 (Accessed: 16 March 2026).

Annotation: Important for the scale argument behind fleet-generated learning data.

Locator / quotation: Main text: “The humanoids market could surpass $5 trillion by 2050” and “more than 1 billion humanoids in use by 2050”.

Access status: Full article used.

[14] Arm Newsroom (2024) ‘Transforming the future of AI and robotics with multimodal LLMs’. Cambridge: Arm. Available at: https://newsroom.arm.com/blog/llms-and-autonomous-robots (Accessed: 16 March 2026).

Annotation: Corporate but useful for the LLM-plus architectural strand.

Locator / quotation: Main text: “The advancements of large multimodal models and General AI (GenAI) herald a new era in AI robotics and humanoid development.”

Access status: Full article used.

[15] Arm Newsroom (2025) ‘Is this the Android moment for mobile robots?’ Cambridge: Arm. Available at: https://newsroom.arm.com/blog/robot-operating-system-iot-r2c2 (Accessed: 16 March 2026).

Annotation: Particularly relevant to the missing HQ layer in the architecture, because it discusses fleet orchestration and analysis.

Locator / quotation: Main text describes R2C2 as “an AI-powered operating system for heterogeneous robot fleets” with “teleoperation over 5G” and “multi-robot collaboration”.

Access status: Full article used.

[16] Toloka (2026) ‘How to build robotics training data that works in the real world’. Amsterdam: Toloka. Available at: https://toloka.ai/blog/robotics-training-data-collection-annotation/ (Accessed: 16 March 2026).

Annotation: One of the clearest practical sources on the data-engine problem itself.
Locator / quotation: Main text: “Most robotics models break down in deployment because their training data doesn’t look enough like real life”.
Access status: Full article used.

[17] Nationwide Children’s Hospital (2024) ‘Smart toys: What parents need to know’. Columbus, OH: Nationwide Children’s Hospital. Available at: https://www.nationwidechildrens.org/family-resources-education/700childrens/2020/10/smart-toys-what-parents-need-to-know (Accessed: 16 March 2026).

Annotation: Useful practical guidance on cameras, microphones, GPS and internet connectivity in child-facing toys.
Locator / quotation: Main text warns about toys with “cameras or microphones”, “GPS or Internet connectivity”, or toys that “request and store data”.
Access status: Full article used.

[18] Checkbook (2023) ‘Are smart toys spying on children?’ Washington, DC: Checkbook. Available at: https://www.checkbook.org/national/consumers-notebook/articles/Are-Your-Kids-Smart-Toys-Spying-on-Them-7737 (Accessed: 16 March 2026).

Annotation: A direct popular warning about smart toys forming relationships and sharing data.
Locator / quotation: Main text: AI-enabled toys may “try and form a relationship with the child and gather and share information with others that could risk the child’s safety or privacy.”
Access status: Full article used.

[19] Which? (2019) ‘Kids’ karaoke machines and smart toys from Mattel and VTech among those found to have security flaws’. London: Which? Available at: https://www.which.co.uk/news/article/kids-karaoke-machines-and-smart-toys-from-mattel-and-vtech-among-those-found-to-have-security-flaws-in-a-which-investigation-aCZvy9z0N7R2 (Accessed: 16 March 2026).

Annotation: A practical consumer-protection reminder that even relatively simple connected toys can already create security risks.
Locator / quotation: Standfirst: tested toys could “potentially put [a] child at risk”.
Access status: Headline and standfirst only.

[20] PIRG Education Fund (2025) Trouble in Toyland 2025: A.I. Bots and Toxics Present Hidden Dangers. Washington, DC: PIRG Education Fund. Available at: https://pirg.org/edfund/resources/trouble-in-toyland-2025-a-i-bots-and-toxics-represent-hidden-dangers/ (Accessed: 16 March 2026).

Annotation: Useful consumer-alert source on disturbing or inappropriate AI-toy interactions.

Locator / quotation: Summary line: “Tests show A.I. toys can have disturbing conversations.”

Access status: Web report used.

[21] AdGuard (2023) ‘Smart toys may compromise children’s safety’. Limassol: AdGuard. Available at: https://adguard.com/en/blog/smart-toys-privacy-concerns.html (Accessed: 16 March 2026).

Annotation: Not academic, but useful as a concise technical-popular account of the privacy risks created by sensors and wireless connectivity.

Locator / quotation: Main text: “the more sensors and cameras a toy has and the more wireless communication technologies it supports, the riskier the toy.”

Access status: Full article used.

Group 3. Science-fiction novels and stories

These entries are included as scenario literature rather than empirical evidence. They are used to illuminate companionship, bounded obedience, surveillance risk, substitute-child themes, and the tension between local intimacy and central intelligence.

[SF1] Asimov, I. (2018) I, robot. London: HarperVoyager.

Annotation: The foundational fictional source for robot safety and bounded obedience. The main value here is conceptual: real child-safe design would require a stricter and more explicit regime, but Asimov remains the obvious starting point.

Locator / quotation: Canonical formulation: “A robot may not injure a human being.”

Access status: Quote verified from standard published wording; full text not used in this session.

[SF2] Aldiss, B.W. (2001) Supertoys last all summer long: and other stories of future time. New York: St Martin’s Griffin. Available at: https://maledive.ecml.at/Portals/45/Aldiss_Supertoys_plain.pdf (Accessed: 16 March 2026).

Annotation: One of the strongest fictional sources for the proposed topic. It combines child-substitute companionship with an early vision of networked domestic intelligence.

Locator / quotation: Story text: beings “will be linked to the World Data Network”.

Access status: Substantial text accessible in PDF.

[SF3] Ishiguro, K. (2021) Klara and the sun. London: Faber & Faber. Available at: https://englishliteratureandcomposition.weebly.com/uploads/1/6/5/1/16517524/klara_and_the_sun_kazuo_ishiguro.pdf (Accessed: 16 March 2026).

Annotation: Probably the strongest recent novel for the child-companion line, especially on loneliness, status, social awkwardness and substitution.

Locator / quotation: Early chapters include discussion of being able to “introduce Klara to your friends”.

Access status: Substantial searchable text accessible.

[SF4] Brown, P. (2016) The wild robot. New York: Little, Brown and Company. Available at: https://www.southwold.hackney.sch.uk/wp-content/uploads/sites/4/2021/03/The-Wild-Robot-By-Peter-Brown-Book.pdf (Accessed: 16 March 2026).

Annotation: Useful mainly as a warning about caregiving drift and the slide from helper to quasi-parental role.

Locator / quotation: Repeated locators in the text refer to Roz as the "mother robot".

Access status: Substantial text accessible in PDF.

[SF5] Chiang, T. (2010) The lifecycle of software objects. Burton, MI: Subterranean Press. Available at: https://cpb-us-w2.wpmucdn.com/voices.uchicago.edu/dist/8/644/files/2017/08/Chiang-Lifecycle-of-Software-Objects-q3tsuw.pdf (Accessed: 16 March 2026).

Annotation: The strongest fictional analogue for the proposed architecture in which local experience is filtered into central technical stewardship.

Locator / quotation: Main text: there is "no way to predict how digients raised in a thousand different settings will turn out".

Access status: Substantial text accessible in PDF.

[SF6] McEwan, I. (2019) Machines like me. London: Jonathan Cape. Available at: https://www.penguin.com.au/books/machines-like-me-9781786142252/extracts/2057-machines-like-me (Accessed: 16 March 2026).

Annotation: Valuable mainly as a privacy warning about domestic humanoids as total witnesses.

Locator / quotation: Extract: Adam records "everything he heard and saw".

Access status: Publisher extract used; not full text.

[SF7] Banks, I.M. (1996) Excession. London: Orbit.

Annotation: Not child-robot-specific, but highly relevant to distributed machine intelligence, local agents and governance asymmetry between humans and powerful machine minds.

Locator / quotation: Use as architecture-and-governance scenario literature rather than as a direct child-robot source.

Access status: Metadata and secondary summaries only.

[SF8] Carey, M.R. (2023) Infinity gate. London: Orbit. Available at: https://cdn.bookey.app/files/pdf/book/en/infinity-gate.pdf (Accessed: 16 March 2026).

Annotation: Relevant primarily to polity-scale AI, surveillance and checkpoint logic. It helps imagine why local life and central intelligence need boundaries.

Locator / quotation: Use as conceptual scenario value; pinpoint quotations remain provisional in current access conditions.

Access status: Preview and secondary material only.

[SF9] Fox, H. (2003) Eager. London: Hodder Children's Books.

Annotation: A useful children's-literature item because it combines self-aware robotics, experiential learning and a corporate future.

Locator / quotation: Common summaries note that Eager can reason, question and learn by experience, which is analytically useful against the proposed tightly bounded child-safe model.

Access status: Metadata and secondary summaries only.

[SF10] Key, J. (2011) Caleb-Seven. Minneapolis, MN: Millbrook Press.

Annotation: A tentative but relevant edge case because the premise directly concerns a robot created as a surrogate child and then demoted.

Locator / quotation: Use as a reminder of the danger of designing robots as replacements rather than bounded companions.

Access status: Metadata and review-level evidence only.

Group 4. Patents

The patent material is useful for identifying primitive or partial embodiments already present in engineering practice, including expressive faces, toy-like form factors, cameras, microphones, Wi-Fi or data links, activity reporting and profile updating.

[PT1] Google Inc. (2015) Agent interfaces for interactive electronics that support social cues, US Patent Application US20150138333A1. Available at: https://patents.google.com/patent/US20150138333A1/en (Accessed: 16 March 2026).

Annotation: One of the clearest patents for networked child-like or toy-like companion devices, with cameras, microphones and domestic-device control.

Locator / quotation: Patent text: an “anthropomorphic device, perhaps in the form factor of a doll or toy” may include “a camera and a microphone array”.

Access status: Full patent text used.

[PT2] Massachusetts Institute of Technology (2014) Interactive systems employing robotic companions, US Patent US8909370B2. Available at: https://patents.google.com/patent/US8909370B2/en (Accessed: 16 March 2026).

Annotation: Relevant because it explicitly envisages robotic companions with social and affective behaviour, including soft or squeezable embodiments.

Locator / quotation: Patent discusses a “robotic companion” and references the Huggable and Huggable Squeeze Doll.

Access status: Full patent text used.

[PT3] Blue Frog Robotics SAS (2012) Social robot, European Patent Application EP2492850A1. Available at: https://patents.google.com/patent/EP2492850A1/en (Accessed: 16 March 2026).

Annotation: Useful for domestic social robotics in general, especially local learning from the surrounding environment.

Locator / quotation: Patent text concerns a “social robot which is capable of interacting with the environment surrounding it, learning from same”.

Access status: Full patent text used.

[PT4] Robauto LLC (2020) Automatic mobile robot for facilitating activities to improve both neurotypical and autistic children’s intellectual and emotional development, US Patent

US10864453B2. Available at: https://patents.google.com/patent/US10864453B2/en (Accessed: 16 March 2026).

Annotation: Particularly relevant to the child-robot strand because it emphasises low-threat embodiment and a friendly expressive face.

Locator / quotation: Patent text: “a non-humanoid toy shape” and “an expressive face perceived as friendly and approachable by autistic children”.

Access status: Full patent text used.

[PT5] Embodied, Inc. (2020) Socially assistive robot, US Patent Application US20200114521A1. Available at: https://patents.google.com/patent/US20200114521A1/en (Accessed: 16 March 2026).

Annotation: Highly relevant to expressive face, affect detection and reporting. It is also important for the boundary between summary reporting and monitoring.

Locator / quotation: Patent text refers to robots that “express facial expressions” and can provide “activity reports”.

Access status: Full patent text used.

[PT6] Affectiva, Inc. (2022) Robotic control using profiles, US Patent US11484685B2. Available at: https://patents.google.com/patent/US11484685B2/en (Accessed: 16 March 2026).

Annotation: One of the clearest patent examples of upstream profile-building from smart toys or robots.

Locator / quotation: Patent text states that a robot smart toy may gather facial and voice data and that a “cognitive state profile is updated” based on data from one or more robots.

Access status: Full patent text used.

[PT7] Elizondo, D., et al. (2021) Emotionally intelligent companion device, US Patent US11074491B2. Available at: https://patents.google.com/patent/US11074491B2/en (Accessed: 16 March 2026).

Annotation: Relevant to expressive face, multimodal sensing and emotional processing, though less specifically child-oriented than some other patents.

Locator / quotation: Patent text describes an “emotional core” and a facial arrangement for “displaying emotions”.

Access status: Full patent text used.